Construction Methods and Equipment

McGraw-Hill Publishing Company, Inc.

August, 1938

Price 20 Cents

This Month:

Building New York's World's Fair

An article, profusely illustrated, describing structural materials and erection methods used for buildings, monuments and bridges for exposition to open in 1939.

Unique steel skeletons support the 700-ft. Trylon and 200-ft.-diameter Perisphere, constituting the Theme Structures of the Fair, symbolic of "Building the World of To-morrow".

flood control

Calls for Inland Piling

Flowing at the rate of a little more than 2 miles per hr., at New Orleans, the mighty Mississippi ordinarily carries about 145 cu. miles of water into the Gulf of Mexico every year, and 400,000,000 cu. yds. of sediment!

At high flood it discharges 2,000,000 cu. ft. per second, and rises 40 to 50 ft. above its natural level. Property damages in periodic flood years have averaged from $50,000,000 to $500,000,000, not counting the losses of rich agricultural soil through erosion.

Today, Inland Piling provides an underground steel wall to make levees safer for the protection of communities annually confronted with this hazard.

For such permanent installations, as well as for temporary use and re-use during construction projects, Inland Piling sections offer a number of outstanding advantages and economies. They drive freely, saving time and labor. The interlocks remain watertight in service. The steel is of special analysis for extra strength and toughness often needed to penetrate hard sub soils.

Experienced Inland engineers will gladly aid you in the planning of piling or other construction work.

Write for the illustrated piling book.

INLAND STEEL CO.

38 SOUTH DEARBORN STREET, CHICAGO
DETROIT • KANSAS CITY • MILWAUKEE • ST. LOUIS • ST. PAUL

SHEETS STRIP TIN PLATE BARS PLATES FLOOR PLATES
STRUCTURALS PILING RAILS TRACK ACCESSORIES REINFORCING BARS

CURRENT JOBS

. . . . and Who's Doing Them

DAMS

Contract for Shasta dam on U. S. Bureau of Reclamation's Central Valley Project in California was awarded to **Pacific Constructors, Inc.**, of Los Angeles at a price of $35,939,450. Shasta dam, 560 ft. in height and containing 5,610,000 cu.yd. of concrete, will be world's second largest concrete structure. Pacific Constructors, Inc., is an organization including the following construction firms: **Griffith Co.; Metropolitan Construction Co.; Lawler & Maguire; Arundel Corp.; American Concrete & Steel Pipe Co.; Foley Bros.; D. W. Thurston; Shafner, Gordon & Hinman; W. E. Callahan Co.** and **Gunther-Shirley Co.; A. Guthrie & Co.; L. E. Dixon Co.;** and **Hunkin-Conkey Co.**

Successful bidder on the Kingsley dam for the Central Nebraska Public Power & Irrigation District was **Martin Wunderlich,** Jefferson City, Mo., with a price of $4,948,116. In Arizona for the U. S. Indian Irrigation Service Rohl-Connolly Co., of Los Angeles, will build the Head Gate Rock dam for $1,890,407. **Massman Construction Co.**, of Kansas City, Mo., bid in for $9,322,960 the Grand River Dam at Vinita, Okla. In New Hampshire B. Perini & Sons, of Framingham, Mass., are building $1,168,925 dam for Pittsburgh reservoir project.

BRIDGES

Low bid of $1,821,234 for Anacostia River bridge in Washington, D. C., was received from **Penker Construction Co.** of Cincinnati, Ohio. For widening viaduct and constructing bascule substructure on Cross Bay Boulevard on Long Island, N. Y., **Johnson, Drake & Piper** of Freeport, L. I., received $1,665,389 contract.

Concrete piers of Meeker Ave. bridge, Brooklyn, N. Y., went to **Reiss & Weinsier, Inc.**, Brooklyn, for $732,814. In Texas a bridge over the Red River on the Texas-Oklahoma state line will be built by **Forcum-James Co.**, Dyersburg, Tenn., for $565,571. In Indiana $289,574 is cost of bridge over Big Eagle Creek in Marion Co. under construction by **Smith & Johnson,** of Indianapolis. For constructing Choctawhatchee Bay bridge in Florida, including steel girder spans and hydraulic embankment, contracts totaling $568,470 were awarded to **Shell Producers Co.**, of Tampa. A bridge over the Arkansas River at Bixby, Okla., will be built for $308,567 by **G. H. James,** of Purcell, Okla.

BUILDINGS

Public — For a high school in New York City low bid of $1,414,000 was received from **HRH Construction Corp.**, New York City. **Pennsylvania Drilling Co.**, of Pittsburgh, is putting down borings preparatory to beginning a $1,000,000 housing development in that city. Foundation construction for $1,500,000 state office building in Sacramento, Calif., went to **Lindgren & Swinerton,** of Sacramento.

M. J. Boyle & Co., of Chicago, are starting work on an $850,000 apartment house in that city. Additional buildings for the Veterans Administration in Dayton, Ohio, to cost $824,000, will be constructed by **N. P. Severin Co.**, of Chicago. At site of New York World's Fair, Flushing, **A. L. Hartridge Co.** is constructing a $500,000 exhibit building for Owens-Illinois Glass Co. and Pittsburgh Plate Glass Co. At Pocatello, Idaho, contract for high school repairs and new gymnasium and auditorium was awarded to **T. G. Rowland,** Salt Lake City, Utah, for $406,959.

Commercial — Jackson Heights, New York. **N. K. Winston,** of New York City, is starting an $8,800,000 project to include 44 six-story apartment buildings. In Jamaica, New York, **Foch Building Corp.**, of St. Albans, New York, is constructing 500 dwellings to cost $3,000,000. Another housing project in Jamaica by **Hyman Rosen** will include 400 two-story dwellings to cost $2,000,000. In Flushing, N. Y., **H. Bonuck,** of Corona, N. Y., will build 250 houses for $1,500,000. A building for the French government at New York World's Fair site, to cost $1,200,000, will be erected by **James Stewart & Co.**, of New York City. A $1,360,000 housing project, to include 18 apartment structures, is under way at Seattle, Wash., by **Henrickson-Alstrom Construction Co.**, of Seattle. In Atlanta, Ga., **G. & L. Construction Co.** of that city is engaged upon an $800,000 project of 160 homes. **J. L. Simmons,** of Springfield, Ill., has a $712,625 contract for building a hospital in that city.

Industrial — For an oil refinery in Shelby, Mont., for Producers Refinery Co. to cost $600,000, low bidder is **Arthur G. McKee Co.**, Cleveland. For Wickwire Spencer Steel Co. at Tonawanda, N. Y., **John W. Cowper Co.**, of Buffalo, is building a $400,000 mill. **F. E. Martin,** of Spokane, Wash., is building a $250,000 warehouse in that city for the Northern Pacific Railroad.

HIGHWAYS

Recent highway contracts awarded included the following: California: 4.6 mi. in Los Angeles County, $108,389, to **Griffith Co.**, of Los Angeles; 2.1 mi. in Fresno Co., $116,377, to **Union Paving Co.**, San Francisco; Colorado: 10 mi. in Routt Co., $138,984, to **G. Knutson,** of Denver. Florida: 6.8 mi. of paving and steel concrete underpass in Duval Co., $238,734, to **W. L. Cobb Construction Co.**, of Tampa. Georgia: 11.4 mi. in Decatur Co., $174,161, to **S. E. Finley,** of Atlanta. Illinois: 6 mi. Logan Co., $189,853, to **R. McCallman, Inc.**, of Danville, Ill. Indiana: 2.3 mi. Allen Co., $178,384, to **McAfee & Smith,** of Bluffton, Ind.; 8.5 mi. in Morgan Co., $247,014, to **Roger Daoust,** of Defiance, Ohio. Kansas: Repaving in Kansas City, $198,000, to **J. A. Tobin Construction Co.**, of Kansas City, Kan. Louisiana: 1.6 mi., Jefferson Parish, $207,258, to **T. L. James & Co.**, Ruston, La. Michigan: 3.1 mi. Jackson Co., $210,882, to **Detroit Asphalt Paving Co.**, of Detroit. Mississippi: 15 mi. highway reconstruction, $303,763, **A. Guthrie & Co.**, St. Paul, Minn.

Construction Methods and Equipment

H. W. Clarke, Vice-President

AUGUST, 1938

Robert K. Tomlin, Editor — A. E. Paxton, Manager

Editorial Staff: Vincent B. Smith, Paul Wooton (Washington), Nelle Fitzgerald

The "How" of it

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

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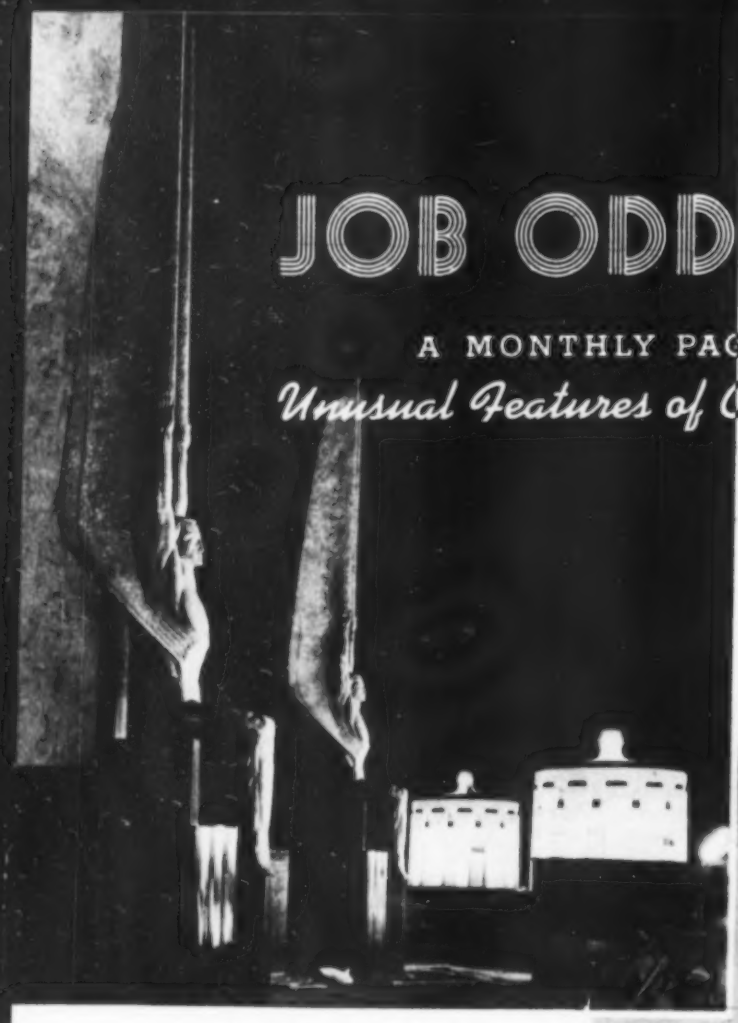
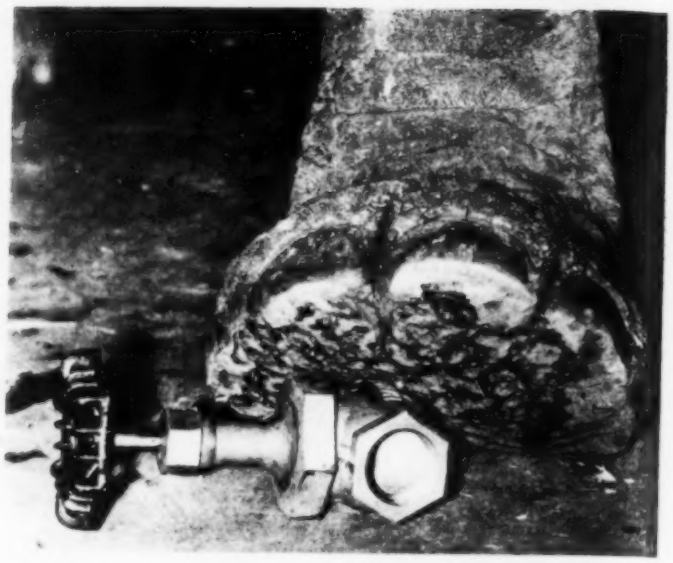
JOB ODDITIES

A MONTHLY PAGE OF

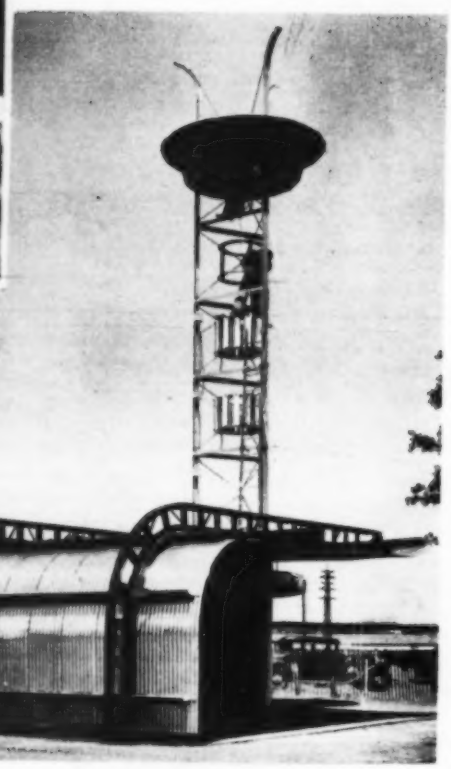
Unusual Features of Construction



WINGED GUARDIANS, cast bronze figures designed for U. S. Bureau of Reclamation by Oskar J. W. Hansen, sculptor, stand watch at either side of 125-ft. flagpole at Nevada end of crest of Boulder dam. Panel at base of figures which stretch wings 30 ft. above crest of dam bears inscription: "The United States of America will continue to remember that many who toiled here found their final rest in the building of this dam."

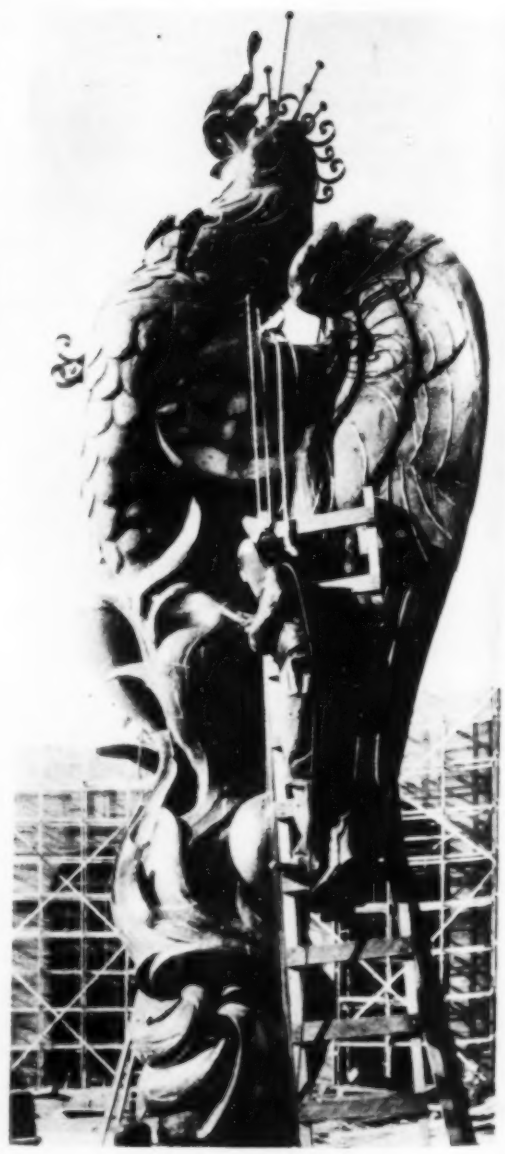


RUGGEDNESS TEST more severe than that of average burly-armed pipe-fitter is applied to Hancock bronze valve, placed under foot of one of Ringling's 10,200-lb. circus elephants.



CURVED OPEN-WEB GIRDERS and corrugated metal sheathing provide unusual canopy for information booth at Flushing Meadow site of New York World's Fair 1939, to be opened to the public next April.

"The boss has a bad sore throat today!"



WELDED PHOENIX (right), symbol of San Francico's rise from its own ashes following the disastrous fire of 1906, takes shape in "fire" 7,000 deg. F. hot as 700 separate hand-shaped 16-gage metal sections are fused into single piece by 6,800 lin.ft. of Lincoln shielded-arc electric welding. Figure 22 ft. tall, weighing 5,000 lb., is assembled around 8-in. H-column.

NEW YORK, SUNDAY, MAY 22, 1927.

LINDBERGH DOES IT! TO PARIS IN 33½ HOURS;
FLIES 1,000 MILES THROUGH SNOW AND SLEET
CHEERING FRENCH CARRY HIM OFF FIEL

COULD HAVE GONE 500 MILES FARTHER

Gasoline for at Least That Much More—
Flew at Times From 10 Feet to
10,000 Feet Above Water.

ATE ONLY ONE AND A HALF OF HIS FIVE SANDWICHES

Fell Asleep at Times but Quickly Awoke—Glimpses
of His Adventure in Brief Interview
at the Embassy.

TOMORROW.

MAP OF LINDBERGH'S TR

LEVINE ABANDONS
BELLANCA FLIGHT

CROWD ROARS THUNDEROUS V

Breaks Through Lines of Sol
Police and Surging to Plan
Weary Flier from His C

AVIATORS SAVE HIM FROM FRENZIED MI

Paris Boulevards Ring With Celebra
and Night Watch—American Fl
wildly Acclaim

N L. JAMES.
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Lindbergh

WAY BACK WHEN

LONG before the first barrel of 'Incor' 24-Hour Cement was sold in 1927, this cement had been pre-tested, first in the laboratory and then in the field, just to prove that 'Incor' produces concrete of the same high strength and durability as its "parent" product, Lone Star Cement. That it does just that is now amply confirmed by 'Incor's ten-year record under grueling service in all kinds of work the country over.

Isn't it a fact that there is always an added measure of assurance in using a product with a proven record of performance? If the answer is 'yes,' as all experience suggests that it should be, then we ask you to consider, either 'Incor' or Lone Star—whichever shows the lowest overall concreting cost on a given job.

Use 'Incor'* where dependable 24-hour service strength saves you money, or where faster curing under job conditions is needed to assure durability; in all other cases, use Lone Star. You gain either way, because better cement makes better concrete—as this illustrated book, entitled "After Ten Years," clearly shows. Write for free copy—address Lone Star Cement Corporation, Room 2274, 342 Madison Avenue, New York. *Reg. U. S. Pat. Off.

LONE STAR CEMENT CORPORATION

MAKERS OF LONE STAR CEMENT...'INCOR' 24-HOUR CEMENT

Four of the fleet of five Trac-Truks at the loading point . . . 2½ miles from the levee site.

Traveling up a 13% grade, loaded to 8 cu. yds. bank measure, at 4 m.p.h.

THE HAUL ROAD RUNS *Down Main Street*

A 2½ Mile Haul Where High Travel Speed Plus Big Capacity *Really Mean Something*

Trac-Truks travel at 23 m.p.h. down 1½ miles of Ironton's Main Street.

Traveling over railroad tracks in intermediate gear.

TRAC-TRUKS Are On the Go—Building Huge Ohio River Levee » » »

● A fleet of 5 Trac-Truks are busy moving 2,000,000 cu. yds. of earth on a levee job at Ironton, Ohio. The haul is approximately 2½ miles . . . over soft borrow pit . . . up a 13% grade ramp where loaded units travel at 4 m.p.h. in second gear . . . over railroad tracks, approach road and fill area in intermediate gear . . . and down 1½ miles of city streets at 23 m.p.h., both loaded and empty. Each unit makes two round-trips per hour, carrying 8 cu. yds., bank measure, on every trip . . . that's 16 cu. yds. per Trac-Truk or a total of 80 cu. yds. hourly production for the fleet of 5.

It's this Trac-Truk ability to haul big loads at high speed that makes for profitable performance on large project work. Ease of maneuverability, perfect flotation over any type of "going," big capacity and plenty of power combine forces to consistently prove the statement that "Trac-Truks Excel on Cycle Time Production". Find out how you can lower *your* yardage costs with Trac-Truks!

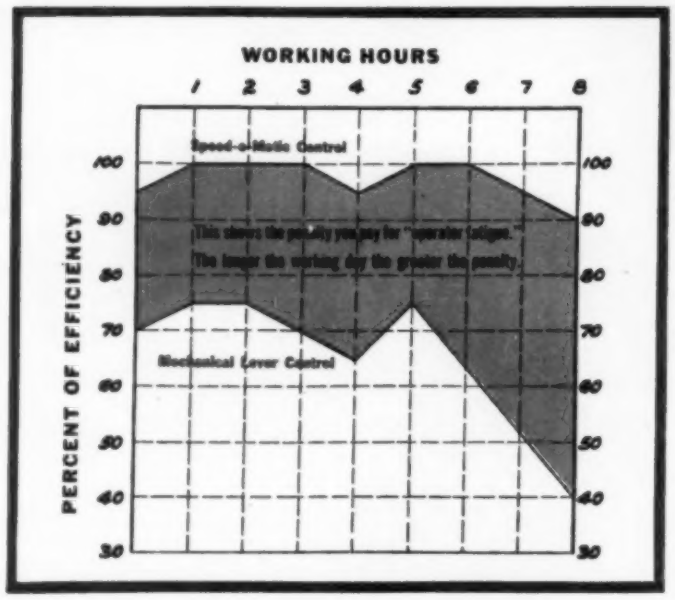
Showing levee site where 5 Trac-Truks are moving 2,000,000 yards of earth.

EUCLID
THE PIONEER

THE EUCLID ROAD MACHINERY CO.
CLEVELAND, OHIO U. S. A.
BRANCH OFFICE 185 EAST BUTLER AVENUE, MEMPHIS, TENN.

DON'T LET YOUR PROFITS PAY the PENALTY OF OPERATOR FATIGUE

● The levers and pedals of the conventional shovel-dragline-crane mechanical lever control system have a long, hard throw, requiring an extremely fatiguing shoulder motion and maximum hip action. This inherently slower operating speed and excessive physical effort are the limiting factors in production, and definitely rob the machine of a substantial part of the output of which it would otherwise be capable. The top curve of the chart shows the much higher maintained efficiency of the Link-Belt Speed-o-Matic machine.



"In your literature, the fatigue time that you advertise between 8 in the morning and 4 in the afternoon, is absolutely correct. I have timed our Link-Belt K-480 Speed-o-Matic day after day, and have found the same number of passes per hour between 8 and 9 in the morning as between 4 and 5 in the afternoon, by the same operator."— R. W. Helmle, Master Mechanic, Utah Constr. Co.

LINK-BELT COMPANY
300 W. Pershing Road, Chicago
Distributors and Offices in Principal Cities

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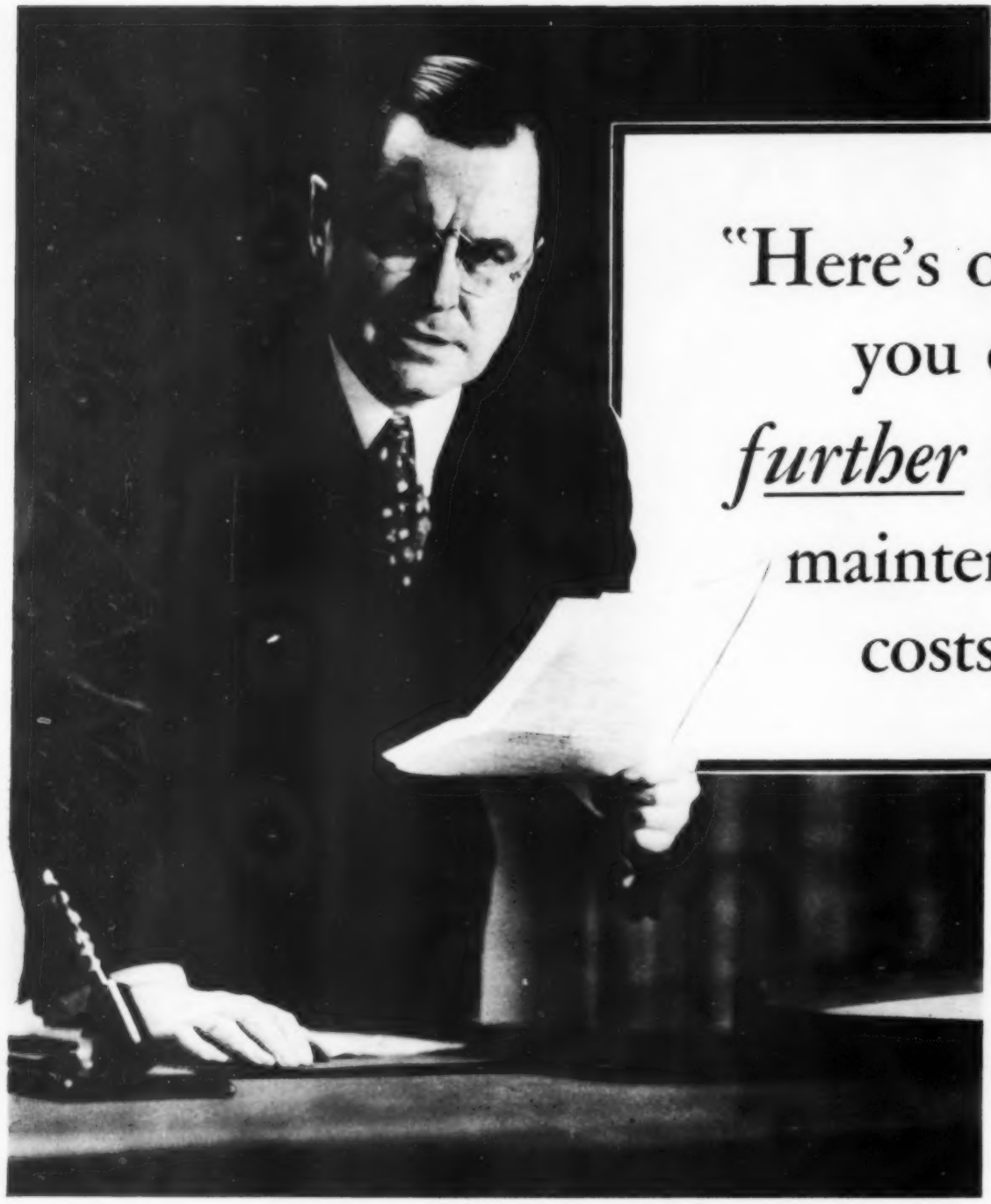
LINK-BELT
Speed-o-Matic SHOVEL
DRAGLINE - CRANE



"Here's one way
you can
further reduce
maintenance
costs...

...put GULF'S *higher quality lubricants* in service at once!"

"SINCE we put Gulf's higher quality oils in service, we have reduced our maintenance costs by more than seven times the increased cost of the better lubricants," says this executive of a large semi-public operating company. "True, our oil bill is three times higher than when we used cheap oils — but that is a negligible factor when compared to a maintenance and operating saving which we figure at more than $200,000.00 a year. Gulf quality lubricants and Gulf engineering service have helped us make remarkable improvements in the operation of our equipment."

Perhaps your maintenance costs can't be reduced as much as that. But no matter what type of equipment you operate, better lubrication with Gulf's higher quality oils and greases can help you bring down maintenance expense to lower levels. When engines and machines are protected with the proper lubricants, operating interruptions and costly repairs are few and far between.

Ask us to send an experienced Gulf engineer to inspect your equipment and recommend improved lubrication practice where it is needed. This money-saving service is available to every contractor from Maine to Texas. Why not take advantage of it—*now?* Gulf Oil Corporation—Gulf Refining Company, Gulf Building, Pittsburgh, Pa.

GULF INDUSTRIAL LUBRICATION

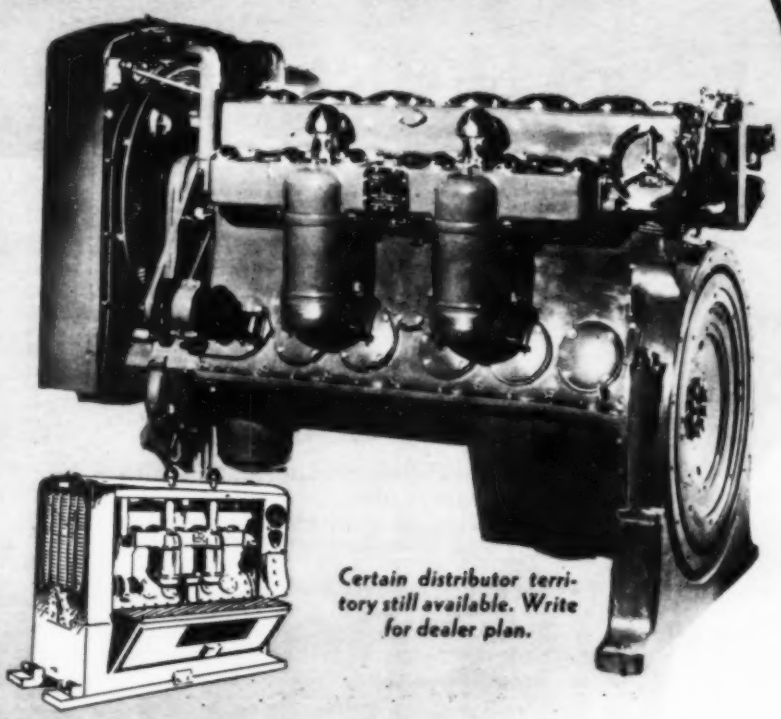
New SIMPLICITY in a DIESEL ENGINE

HERE is new simplicity in Diesel engine design—simplicity that minimizes injection troubles and eliminates delay.

This is the pump and injector of the Murphy Diesel—a complete fuel system for each cylinder in one unit—interchangeable—no adjustments—can be removed and replaced in a moment's time.

There are no high pressure fuel lines to break or leak and disturb uniform injection. Injectors cannot become airbound, and no priming is required. This is characteristic of the advanced design of Murphy Diesel engines. You will want to know about other Murphy advantages. There are no separate starting engines. Insulated pistons eliminate the troubles of sticky rings, and other unusual features result in greater power and economy. Send for our new bulletin.

MURPHY DIESEL COMPANY LTD.
5324 W. Burnham Street Milwaukee, Wisconsin



Certain distributor territory still available. Write for dealer plan.

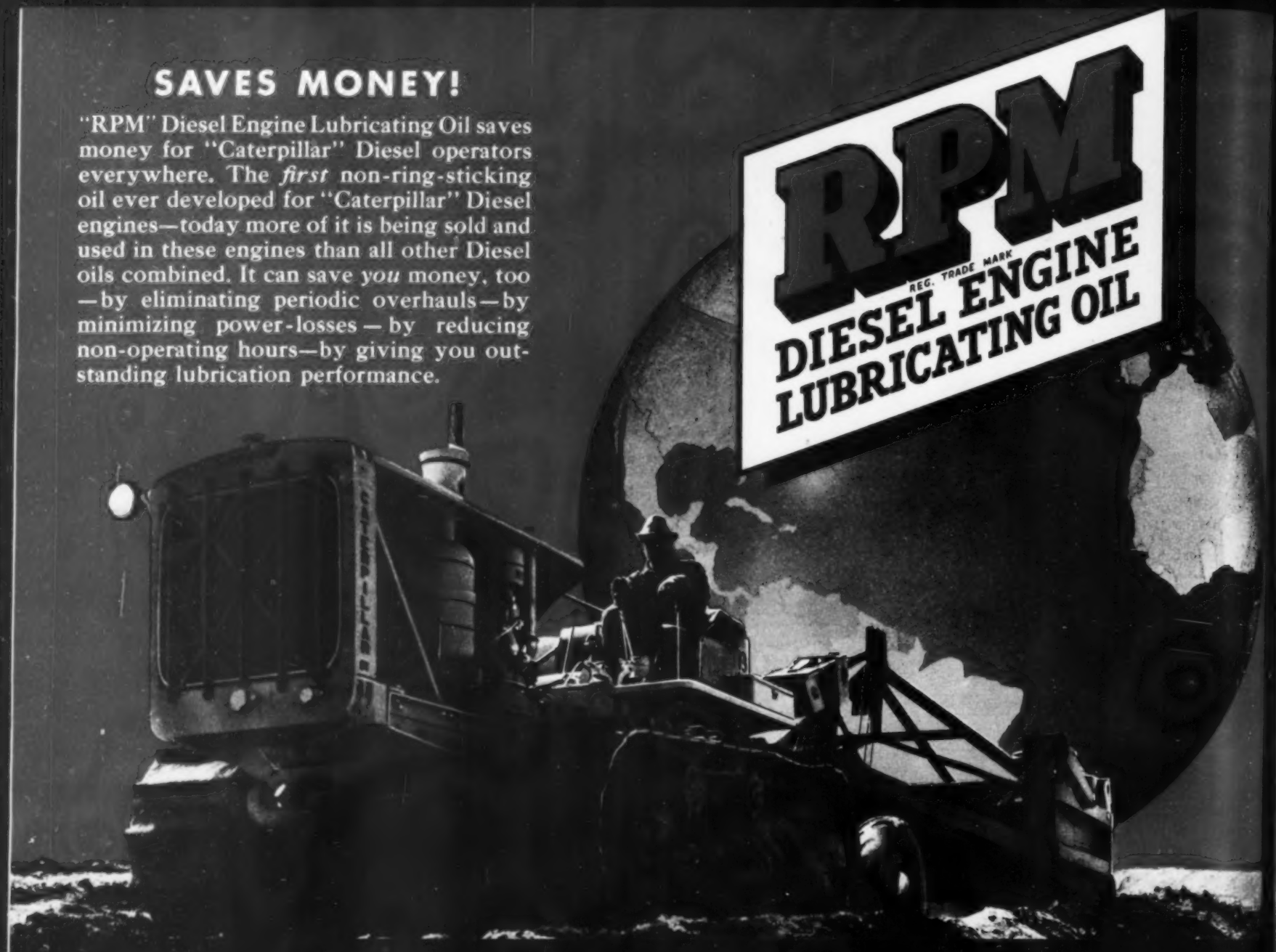
MURPHY DIESEL

The outstanding advance in DIESEL ENGINES

Ask for a **MURPHY DIESEL ENGINE** *on your Equipment!*

SAVES MONEY!

"RPM" Diesel Engine Lubricating Oil saves money for "Caterpillar" Diesel operators everywhere. The *first* non-ring-sticking oil ever developed for "Caterpillar" Diesel engines—today more of it is being sold and used in these engines than all other Diesel oils combined. It can save *you* money, too—by eliminating periodic overhauls—by minimizing power-losses—by reducing non-operating hours—by giving you outstanding lubrication performance.



The World's 1st Choice

FOR "CATERPILLAR" DIESEL ENGINE LUBRICATION

"RPM" Diesel Engine Lubricating Oil is distributed by the following companies under the brand names indicated:

IN THE UNITED STATES

"RPM" Diesel Engine Lubricating Oil:

THE CALIFORNIA COMPANY (Montana only)
THE CARTER OIL COMPANY, Tulsa, Oklahoma
HUMBLE OIL & REFINING COMPANY
STANDARD OIL COMPANY (Indiana)
STANDARD OIL COMPANY (Inc. in Kentucky)
STANDARD OIL COMPANY (Nebraska)
STANDARD OIL COMPANY OF CALIFORNIA
STANDARD OIL COMPANY OF TEXAS
UTAH OIL REFINING COMPANY

Diol "RPM" Diesel Engine Lubricating Oil:

COLONIAL BEACON OIL COMPANY, INC.
STANDARD OIL COMPANY OF LOUISIANA
STANDARD OIL COMPANY OF NEW JERSEY
STANDARD OIL COMPANY OF PENNSYLVANIA

Signal "RPM" Diesel Engine Lubricating Oil:

SIGNAL OIL COMPANY

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THE STANDARD OIL COMPANY (Ohio)

IN CANADA

"RPM" Diesel Engine Lubricating Oil:

IMPERIAL OIL LIMITED
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THROUGHOUT THE WORLD

"RPM" Diesel Engine Lubricating Oil is also available through distributors in more than 100 other countries.

STANDARD OIL COMPANY OF CALIFORNIA

WHO STARTED THIS SWING—

TO ALLOY ROLLED STEELS IN EXCAVATOR DESIGN?

● Certainly, we would never go back to the old style excavator construction. Nor do we blame others for gradually abandoning it in favor of alloy steels. But we do take a little pride in the fact that P&H originated this new type of construction in the excavator industry. And our long experience with electric arc welding, convinces us that P&H design and construction is "five years ahead of the field." The inspection of one of these new P&H Pacemakers will convince you, too. Write the Harnischfeger Corp., 4434 W. National Avenue, Milwaukee, Wisconsin.

The only ¾ yd. machine on the market mounted on true tractor-type crawlers.

17 DIFFERENT MODELS
ranging from 3/8 to 5 cu. yds. capacity with 7 attachment combinations.
Gas, Diesel or electric power.
Write for literature on the size and type you need.

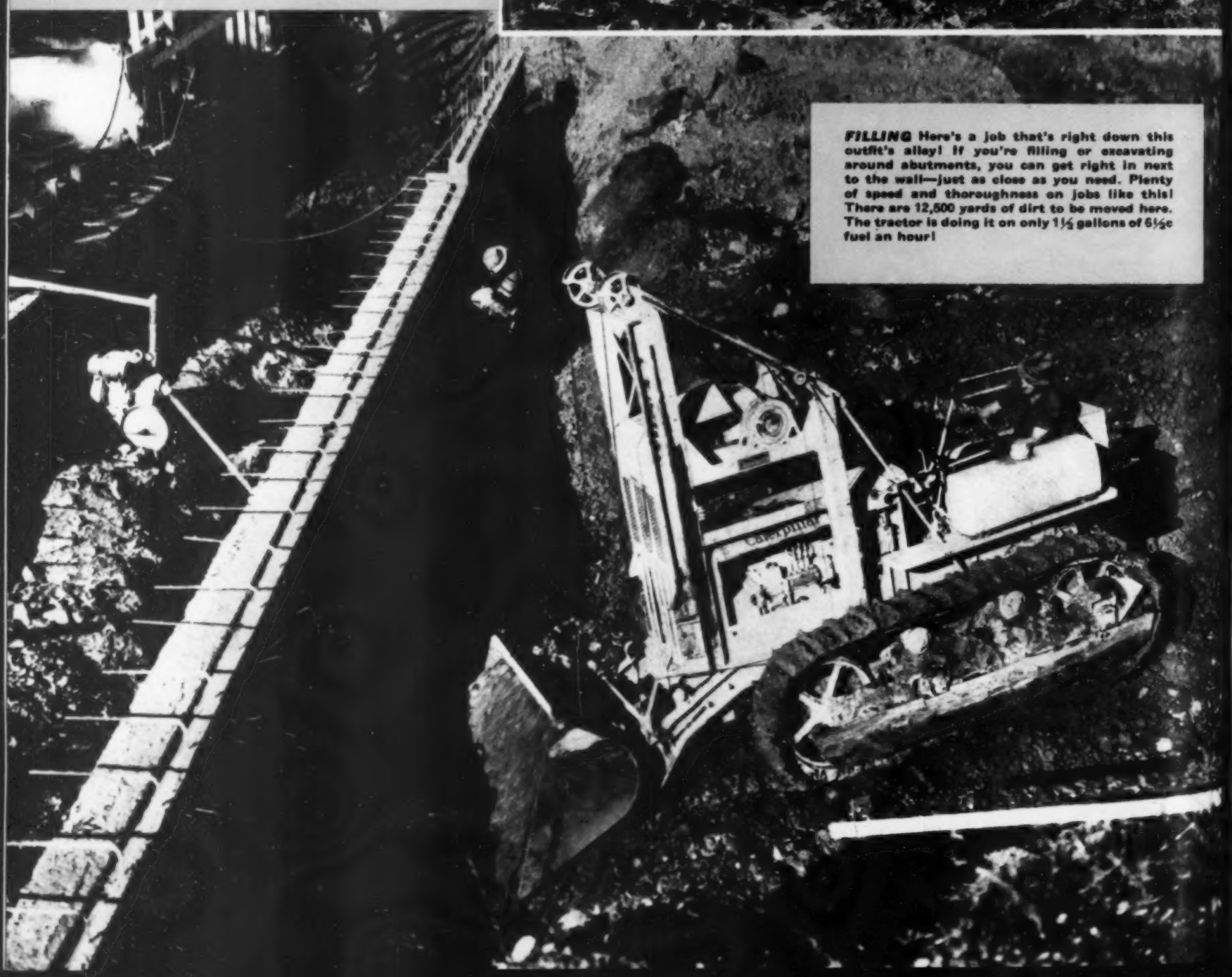
HARNISCHFEGER
CORPORATION

EXCAVATORS • ELECTRIC CRANES • ARC WELDERS **P&H** HOISTS • WELDING ELECTRODES • MOTORS

"IT'S A MONEY-

HAULING Krummel & Jansen, St. Louis, Missouri, own this "Caterpillar" Diesel D4 Tractor, with a Trackson high shovel. At the time the picture was taken, this outfit was loading, hauling and dumping as much as 27 yards per hour on a 100-foot haul! To level the fill, a bulldozer could be attached in five minutes. And on some types of work, the shovel itself serves as a 'dozer!

EXCAVATING With this machine, you can get into the corners and do a clean, accurate, quick job of excavating! Furthermore, the shovel's "high lift" allows enough clearance to dump up on the bank from the pit. At right is shown a basement job with frost in the ground, and sticky soil below the frost. On a 50-foot haul, the tractor carries an average load of ¾ yard . . . handles 30 yards an hour.



FILLING Here's a job that's right down this outfit's alley! If you're filling or excavating around abutments, you can get right in next to the wall—just as close as you need. Plenty of speed and thoroughness on jobs like this! There are 12,500 yards of dirt to be moved here. The tractor is doing it on only 1½ gallons of 6½c fuel an hour!

MAKER

...ON ANY JOB!"

Here is a machine that's about as *handy . . . versatile* . . . and *profitable* as you can find! It's a "Caterpillar" Diesel D4 Tractor, with a Trackson high shovel.

Low first-cost . . . inexpensive maintenance . . . economical fuel-consumption . . . and ability to perform widely different types of jobs *make it one of the best paying pieces of equipment you'll ever put to work!*

Space limitations, here, prevent showing all this outfit's uses—and giving more than a few reports on its speed and fuel-economy. Yet these should be enough to pretty well indicate this machine's money-making and money-saving possibilities! Write us direct, or see your nearest "Caterpillar" dealer for more particulars.

LOADING Three different types of gravel are going into this truck-load. The outfit shuttles back and forth between the truck and the three piles which are 60 feet apart. Working 10 hours a day, it moves 45 yards of material an hour . . . moves and loads! Fast. Economical. Owned by Amidon Bros., of Pueblo, Colorado.

A FEW REPORTS FROM THE FIELD
ABOUT THE "CATERPILLAR" DIESEL D4 TRACTOR with TRACKSON HIGH SHOVEL

- *"It is loading 50 yards an hour into 4-yard trucks for Krummel & Jansen, St. Louis, Missouri."*
- *"When trucks can't get to the shovel, this shovel can take the load to the truck."*
- *"Bulldozer may be attached in five minutes for leveling and filling."*
- *"Job-to-job speed of 5.4 m.p.h."*
- *"Pivots in its own length—dumps at any height."*

CATERPILLAR

REG. U.S. PAT. OFF.

TRACTOR CO. PEORIA, ILL.

DIESEL ENGINES • TRACK-TYPE TRACTORS • ROAD MACHINERY

EXCAVATING COSTS reduced with big YARDAGE

Anthony Lashier & Company, Niagara Falls Contractor, gets 1¼ cubic yards in his ¾ Yard Model 42 BAY CITY

BAY CITY SHOVELS
12 Sizes
⅜ to 1¼ Yard
Also truck mounted shovels and cranes

The many exclusive and time tested developments incorporated in BAY CITY equipment have made them real *Yardage Producers* which means lower excavating costs.

Unit castings for stability—powerful chain crowd for greater work ranges—tandem drums for straight cable or chain lead with any type boom—anti-friction bearings on all shafts to reduce power loss—helical cut gears for quiet operation—electric dipper trip which alone adds 10 to 15% to daily yardage—full honest size struck measure buckets are only a few of the features that have paid big dividends to BAY CITY users.

Whether you buy a ⅜ yard or 1¼ yard BAY CITY, you will find the same uniform quality, the same careful design and the same ease of operation. It will pay you to *compare* before you buy your next shovel, crane, dragline or trench hoe.

Write for new booklet "COMPARE"—No obligation.

BAY CITY SHOVELS, Inc., Bay City, Michigan
Export Office: H. M. Hein, 330 W. 42nd St., New York (Oparo)

BAY CITY SHOVELS

Long after this impeller

GAVE OUT..

..."NI-HARD"

CARRIED ON!

. . showed more than twice the life — handling a highly abrasive product

Failure at the end of 551 hours was the average record of eight plain white cast iron impellers. Yet, operating under identical service conditions, six Ni-Hard* Nickel-Chromium Cast Iron impellers demonstrated an average life of 1319 hours. • These results were obtained from tests conducted at the Copper Cliff, Ontario, operations of the International Nickel Company. Here were the conditions: A highly abrasive product averaging 72% solid matter, handled by pumps having a vertical lift of 28 feet. As may be seen from the illustration, tests were continued until each set of castings was almost completely worn out. • Under such conditions as these you'll find it economical to use Ni-Hard, a durable alloy white iron. An extremely hard chilled or sand cast material, Ni-Hard cast iron usually contains 4.50% Nickel and 1.50% chromium. Consultation on the use of this and other Nickel cast iron compositions is invited.

*Reg. U. S. Pat. Off. Canadian patent number 281986.

Before and after — What happens to plain white cast iron impellers operating in pumps handling highly abrasive materials.

NICKEL CAST IRONS

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

CARRYALLS PRODUCE "SHOVEL MIX" AT UNITY DAM

Shovel mix was specified for Unity Dam, key structure of the Burnt River Project of the Bureau of Reclamation in Eastern Oregon. Yet, LeTourneau Carryall Scrapers excavated and placed 70% of the 205,967 cu. yd. of embankment material. Because borrow areas were 2,500 feet from the dam site, tandem units were used: two consisting of 13-Yard and 8-Yard LeTourneau Carryalls; the third, of two 12-Yard Carryalls.

Two borrow areas were established: one for pervious material; the other for impervious material, consisting of clay and river sand and gravel. In the impervious pit, the top 5 feet was, in itself, unfavorable; yet, stripping and wasting this layer was prohibitive.

Here, the contractor took advantage of the extreme flexibility of Carryalls . . . loaded tandem units diagonally down slope, through each stratum in such a manner as to get a proper mix between the top layer and the next 15-foot layer. On this 20-foot face (1) the front Carryall excavated a half-load from the top layer, (2) raised it to carrying position, (3) loaded the second Carryall from the top layer and second layer in one sweep, (4) then, finished loading the front Carryall entirely from the bottom layer. In each case, the loading action blended materials thoroughly.

These typical LeTourneau savings were figured into the bid price; helped to lick competitive prices. It will pay you to investigate the hundreds of jobs the country over where contractors have met today's bid prices and come out with profits . . . with the aid of LeTourneau equipment. There's a tool for literally every excavation job . . . backed by amazing economy records and equipment stamina. Your "Caterpillar" dealer is ready with the facts and complete demonstrations . . . right on your job.

LETOURNEAU

R. G. LeTOURNEAU, INC., • Peoria, Illinois • Stockton, California • Cable Address: "Bobletorno"

Manufacturers of: Angledozers*, Buggies*, Bulldozers, Carryall* Scrapers, Cranes, Drag Scrapers, Power Control Units, Rooters*, Treedozers.

*Name Registered U. S. Patent Office

NOW'S the Time to make "Small Dirt" Pay BIG

● Government spending for construction work has started. The building trend continues up and is the No. 1 bright spot today.

Because of this, many smaller jobs for suitable, modern small shovels are constantly appearing and contractors who are awake to their profit possibilities are grabbing them off.

You, too, can make handsome profits on these small jobs located within a few miles of you.

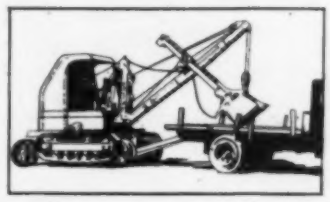
Competition for this work often is hand labor or slow, obsolete and expensive "junk" equipment.

Therefore, if you get equipped with the new fast, versatile and low-cost Byers ⅜-yd. Bearcat Jr. you will be in a good position to make and keep a handsome profit.

You wouldn't shoot rabbits with an elephant gun. Neither will you make big money on small jobs with a shovel that eats up 20 or 25 gallons of gas a day with proportionately high maintenance costs.

Bearcat Jr. contractors can dig all day on 10 gals. of gas,

1 pint of oil and 1 lb. of grease. Their total operating costs, including depreciation, repairs and maintenance, average only $9.74 a day plus operator.



Earnings amount to $50 to $100 a day on small jobs. *Compare these earnings and costs with your present earnings and costs.*

The wide variety of work you can do with a Bearcat Jr. keeps it busy more days a month.

Its simple handy trailer hauls this shovel behind a light truck. Moving costs are low. (One owner moved his Bearcat Jr. 150 times in 14 months).

So, here's an opportunity staring you in the face. Don't pass it up without investigating. Other contractors are cashing in. So can you! Get the lowdown today on this low cost, useful shovel, *Byers Bearcat Jr.*, and grab off a share of these big paying small jobs. Write today for complete information.

THE BYERS MACHINE CO., RAVENNA, OHIO

Distributors throughout the world

BYERS

SHOVELS · CRANES · DRAGLINES · TRENCH HOES

THE SHOVEL THAT IS ALWAYS BUSY

for LOWEST COST PER GALLON

Use JAEGER Sure Prime Pumps

Only in a Jaeger do you get the Patented Priming Jet for fastest known 100% automatic prime, Patented Lubri-Seal for long-life, perfect sealing, Patented Self-Cleaning Shell and Jaeger Open Impeller for handling dirty water in maximum volume, without clogging or a sign of wear, thru thousands of hours of heavy service. Jobs are safer, dewatering costs lower with a Jaeger. Get our Catalog and Prices.

THE JAEGER MACHINE CO.
800 Dublin Ave., Columbus, Ohio

Ahead on All Three!

- **CAPACITY (Lays Material Faster than Most Plants Can Mix It)**
- **ADAPTABILITY (Lays Stone, Macadam, Hot or Cold Mixes—Widths to 14 Ft.)**
- **SMOOTHNESS (Equivalent to Form Job)**

Capacity exceeds 100 tons an hour on many jobs. Long equalizing runners act as movable forms. Weight and traction are confined to hard subgrade. Lays wide widths, blends joints, paves flush to curb or header— cuts costs, does better job. Send for Catalog.

THE JAEGER MACHINE CO., 800 Dublin Ave., Columbus, Ohio
World's Largest Builder of Spreading and Finishing Machines

JAEGER *Bituminous* PAVER

We Also Build Popular Priced, Tractor Drawn Model for Light Retread and Stabilized!

Mix-in-Place ROAD BUILDER

Gives a better mix and smoother surface to heavy mat or stabilized base — IN ONE PASS! Send for Catalog and actual job records.

THE JAEGER MACHINE CO., 800 Dublin Avenue
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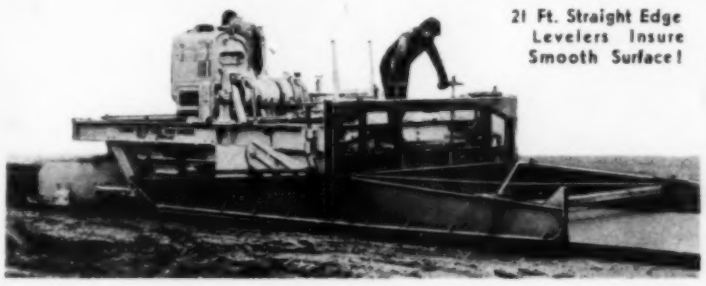
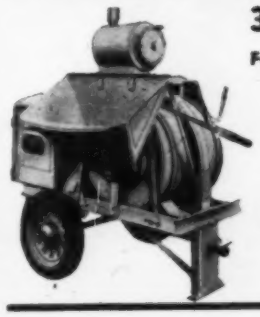


21 Ft. Straight Edge Levelers Insure Smooth Surface!

BIGGEST NEWS IN SMALL MIXERS!

BOTH JAEGERS—BOTH MONEY-MAKERS



3½S UTILITY WITH MEASURING BATCH HOPPER

Fast as a Power Loader—Up to 40 Yds. a Day

Load next batch while you mix and discharge — no waiting — 30% to 40% more yardage daily, all your job can handle. Saves you about half the cost of heavy 5S Non-Tilts. Get new catalog and prices.

THE JAEGER MACHINE COMPANY
800 Dublin Avenue Columbus, Ohio

Use these 3 Lehigh *products for* dependability speed performance

From coast to coast this old-established portland cement is known and used for its dependability. For any use of cement where normal curing time may be allowed, use

LEHIGH NORMAL CEMENT

To all the well-known quality attributes of Lehigh Cement, Lehigh Early Strength Cement adds speed. Compared with normal cement used under the same conditions, it cures to service strength in 24 to 48 hours, instead of 7 days. It makes concrete of maximum density and plasticity. For any use of concrete when speed is desirable or may be an economy, use

LEHIGH EARLY STRENGTH CEMENT

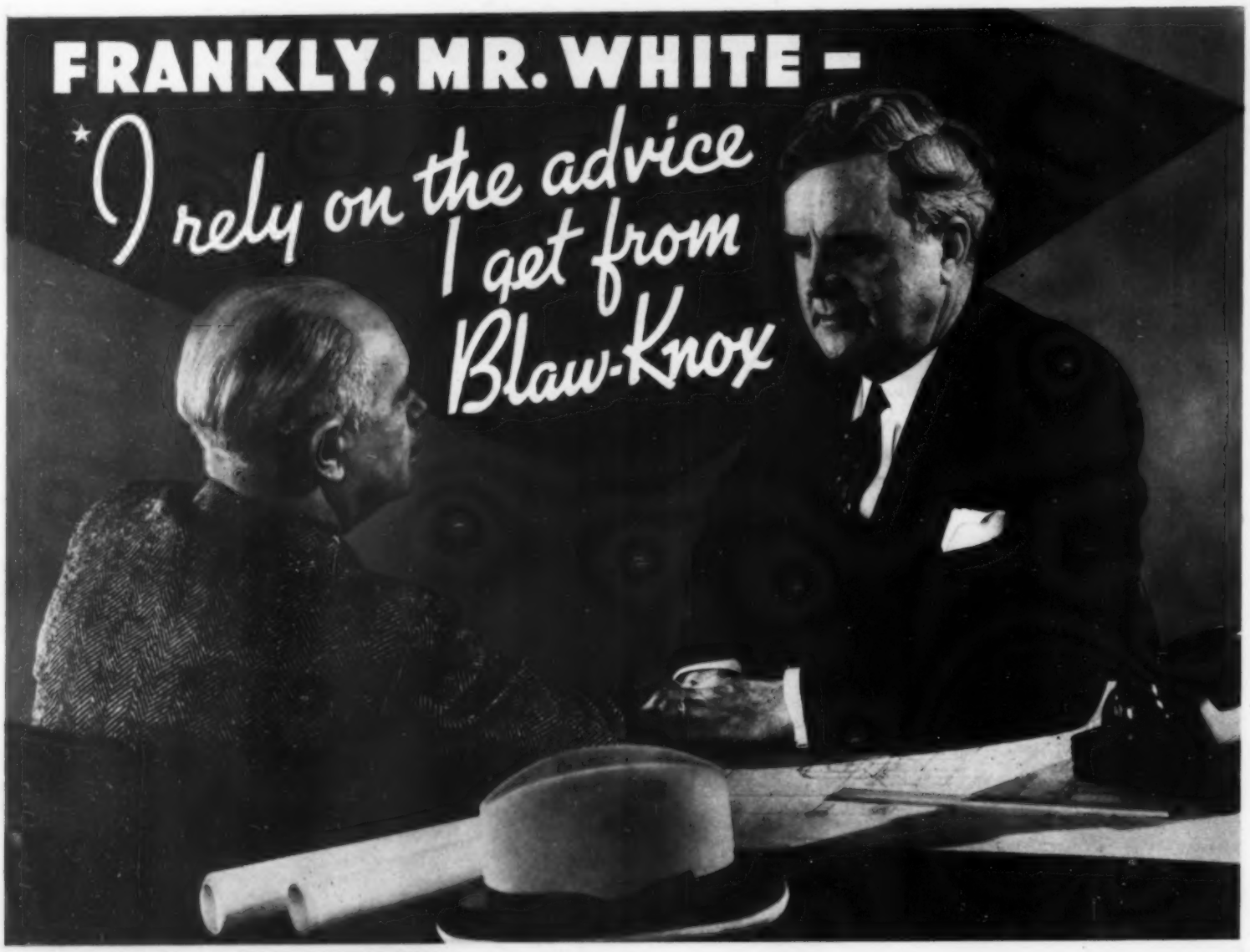
In Lehigh Mortar Cement, Lehigh dependability shows in performance on the job. With only sand and water to add, there is less work at the mortar box. Extreme plasticity, high water retention, strong bond, adhesiveness, minimum shrinkage, water repellency and good strength combine to make the ideal all-purpose masonry mortar. For economy, speed and dependable performance, use

LEHIGH MORTAR CEMENT

The Lehigh Service Department will gladly answer any inquiries pertaining to the specific use of any Lehigh product, or informative literature will be sent.

LEHIGH PORTLAND CEMENT COMPANY

ALLENTOWN, PA. CHICAGO, ILL. SPOKANE, WASH.



BLAW-KNOX
Construction Equipment
Includes—

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Batcherplants
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Central Mixing Plants
Trukmixers
Agitators
Truck Mixer Loading Plants
Ready Mixed Concrete Plants
Concrete Buckets
Clamshell Buckets
Weighing Batchers
Surgraders
Tamping Rollers
Steel Forms
Open Steel Bridge Decking
Steel Grating
Steel Castings
Lubrication Systems
Pressure Piping Systems

It has long been the practice of Blaw-Knox to extend the helping hand of experience to construction men—a service far beyond the mere selling of equipment.

Blaw-Knox expresses its interest in your job with real, fundamental reasons for applying proper equipment to the work—to the end that job progress will be better, costs lower, and that profits will be definitely assured.

What helps your business, naturally helps Blaw-Knox. Blaw-Knox Construction Equipment has been sold on that basis for more than thirty years.

BLAW-KNOX DIVISION
OF BLAW-KNOX COMPANY

FARMERS BANK BUILDING PITTSBURGH, PA.

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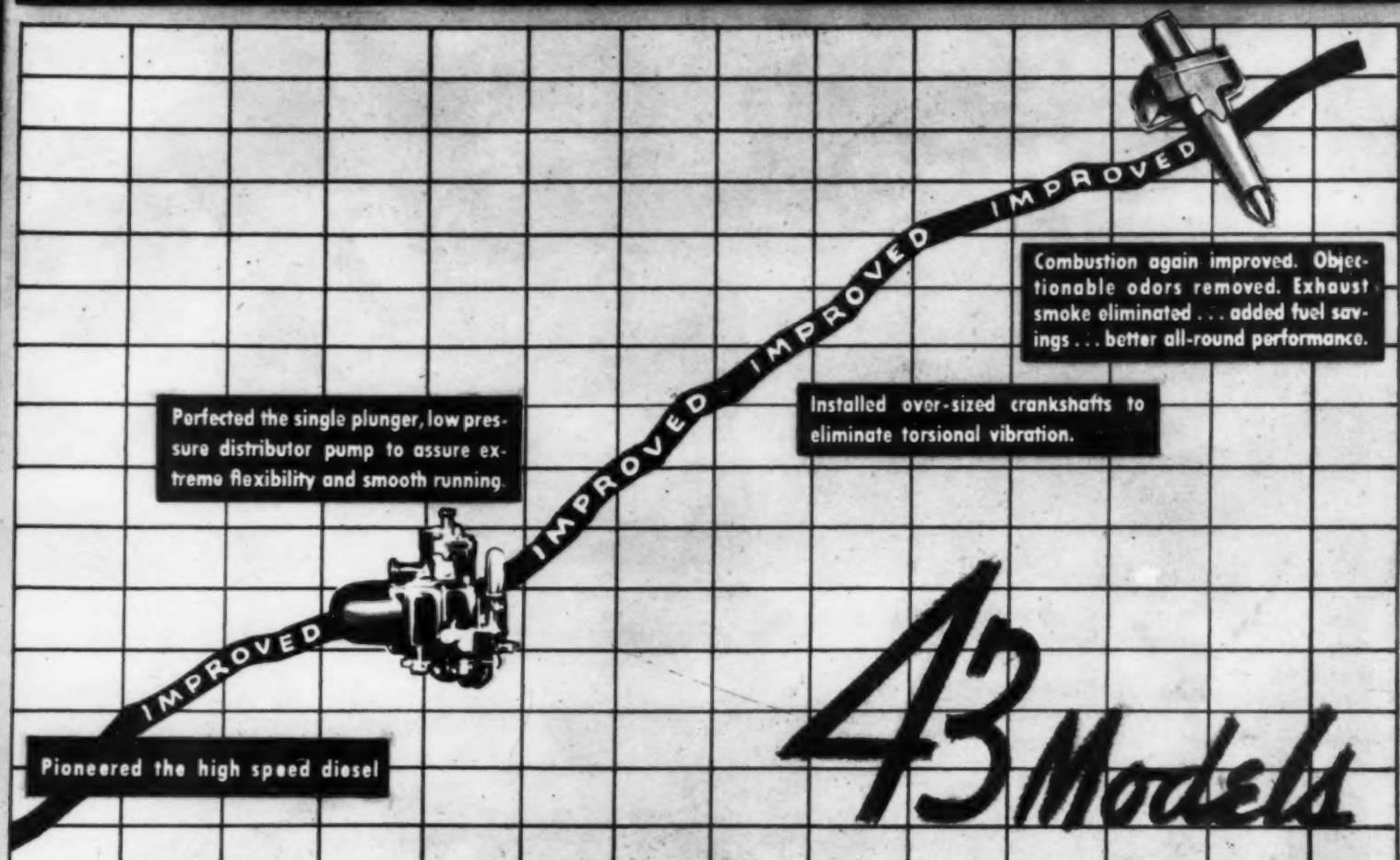
BLAW-KNOX

No Recession



CUMMINS
Dependable
DIESEL
PIONEER IN MODERN DIESEL DEVELOPMENT

MEMO • FROM C. L. CUMMINS

Cummins Improvement knows no recession. If we built a diesel engine to serve, creditably, only one or two industries, the "improvement curve" might have levelled off. But the use of the Cummins Diesel is as widespread and varied as industry itself . . . the power need of each industry has become a separate test block of its own.

Whatever your power need (industrial, automotive, or marine) remember this: The Cummins Diesel has been field-tested and field-approved, not only in the use to which you will put it, but in the widest variety of power applications ever given ANY diesel engine.

C. L. Cummins
PRESIDENT
CUMMINS ENGINE COMPANY, COLUMBUS, INDIANA

KOEHRING TRAIL-DUMP

EASY LOADING

—Low, wide body of the Koehring Trail-dump allows quick and easy loading, from a shovel dipper, dragline bucket or elevating grader. Three point suspension and free motion of swiveling hitch yoke permits travel through ditches, over furrows and up and down steep dump grades, with full traction of all wheels.

KOEHRING HEAVY DUTY

KOEHRING COMPANY

Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks

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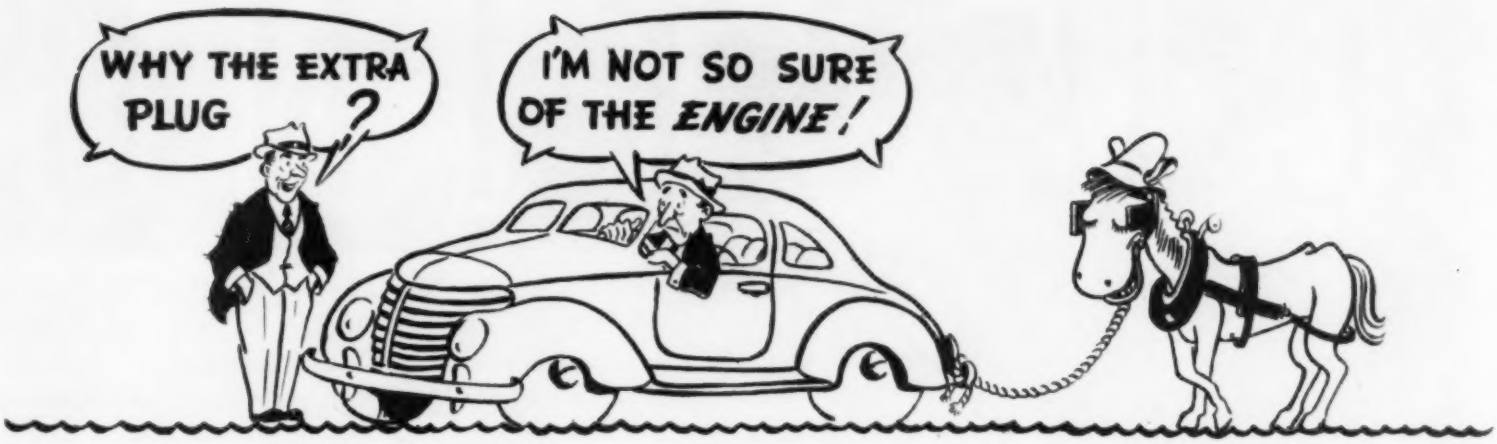

You wouldn't buy a car when you weren't sure of the engine. Why buy a pump when you are not quite sure of the power unit. The answer is, of course, Novo Pumps—the only manufacturer of contractors pumps who build their own engines.

Novo's Knowledge of Power is the reason you will find the most adequate power units on all sizes of Novo Pumps—Self-Primers, Diaphragm, Pressure, and Road Pumps. Then, there is the one source of: responsibility, parts, and service on both pump and engine.

2" Self-Priming Centrifugal

For an easily portable, utility pump, this Novo 2" Self-Primer is the "pumpingest" piece of machinery you ever saw. There are no toy characteristics found in this pump – no built to a price appearance or performance.

It has a *full 2 H.P.* engine – a *full 6100 GPH* capacity – *double protection* handles – *constant duty* seals and an *air* wheel. It is smooth to handle for it is well balanced with a low center of gravity, making it hard to tip over.

Streamlined power unit – Power unit is an air cooled Novo Engine, 2 H.P., streamlined for the most efficient flow of cooling air over the head and block. It is a rugged, compact engine of marked simplicity. Crankshaft and camshaft are mounted on anti-friction bearings.

Novo Self-Primers are built in 16 sizes up to 90,000 GPH. Gasoline or electric power.

Send for information and prices.

Novo 2" Self-Primer, Model A-10. The compact little pump that "will stay right in there and pitch" the water.

NOVO ENGINE CO.

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LIGHT PLANTS STARTING UNITS

Send This

Send descriptive literature and prices on Novo Pumps as indicated below.
2" Self-Primer — Other sizes Self-Primers — Diaphragm Pumps — Pressure Pumps — Road Pumps —

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City ..... State .....

What has "ON TIME DELIVERY" *to do with Construction Profits?*

Be sure that the Quality Symbol of the Concrete Reinforcing Steel Institute is on all Concrete Reinforcing Bars you buy.

YOUR best opportunity for profit lies in finishing jobs on time or even before. This is especially true when there is a penalty clause in your contract. Finishing jobs on time makes it possible for you to complete more jobs per year . . . gives you maximum production from each labor hour and piece of equipment.

But you can't beat time if you have to wait for materials. That is why "on time delivery" by distributors of U·S·S Concrete Reinforcing Bars is so important to you. Our distributors are strategically located and carry ample stocks of standard shapes and sizes, so that no matter where your job may be you can always count on having U·S·S Concrete Reinforcing Bars on hand when you need them.

All U·S·S Concrete Reinforcing Bars carry the Quality Mark of the Concrete Reinforcing Steel Institute. This is your assurance that these bars meet the highest standards in the industry. For to carry this symbol of quality, concrete bars must be rolled from new billet steel of standard specifications and must be a product of domestic manufacture.

When you need concrete reinforcing bars, look to our distributors for a product of the highest quality and a service that will save you money. If your job requires special attention, we are equipped to cut and bend U·S·S Concrete Reinforcing Bars wherever facilities are inadequate.

U·S·S CONCRETE REINFORCING BARS

Manufactured by

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
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United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

Excellay *Preformed* Wire Rope reduces equipment operating costs

THE construction field is turning more and more to the use of American Tiger Brand EXCELLAY Preformed Wire Rope because its many advantages can be summed up in a single word—*Economy*.

EXCELLAY Preformed Wire Rope is "relaxed." It is free from the internal stresses present in standard rope. This enables it to withstand fatigue to a greater degree. It does not break up so quickly from abrasive wear. It resists kinking and winds smoothly and easily on the drums, reducing uneven wear and drum abuse. It is easier to splice, easier to install, and safer to handle.

Specify EXCELLAY Preformed Wire Rope and get greater value for your money. Our engineers will be glad to cooperate with you.

You can depend upon the wire rope on the Yellow Reel

AMERICAN STEEL & WIRE COMPANY

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UNITED STATES STEEL

INTERNATIONAL POWER
DOES THE JOB BETTER AND SAVES MONEY

The powerful, economical International TD-40 Diesel TracTracTor is the outstanding investment in the crawler-tractor field.

• The *quality* International Harvester builds into International Industrial Tractors and Power Units *pays dividends* to owners when this equipment goes on the job. Brilliant performance, low-cost operation and maintenance, dependability, and long life are what you can expect when International Power works for you. Watch these tractors licking a tough dirt-moving job, for example—then look into the cost sheets. We think such evidence will convince you that International Power *offers the best solution to your own power problems.*

International TracTracTors (crawlers) and International Wheel Tractors are available in several models for gasoline and Diesel operation International Power Units are built in eleven models, ranging up to 110 max. h.p. for gasoline, gas, and Diesel operation. International Modified Units are supplied to equipment manufacturers only, and always sold as integral parts of high-grade equipment.

Investigate International Industrial Power—*it will make money for you.* The nearby International industrial dealer or our Company-owned branch will give you complete information. Remember this: no matter where your jobs take you, International *after-sale service* is always close at hand to keep International equipment operating *the maximum number of hours.*

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
180 North Michigan Avenue — Chicago, Illinois

An International Diesel Engine powers this motor grader, effecting economies on maintenance work as well as new construction.

An International-powered locomotive cuts handling costs in this brick and tile plant.

INTERNATIONAL Industrial Power

Construction Methods and Equipment

Established 1919 McGraw-Hill Publishing Company, Inc.

ROBERT K. TOMLIN, Editor

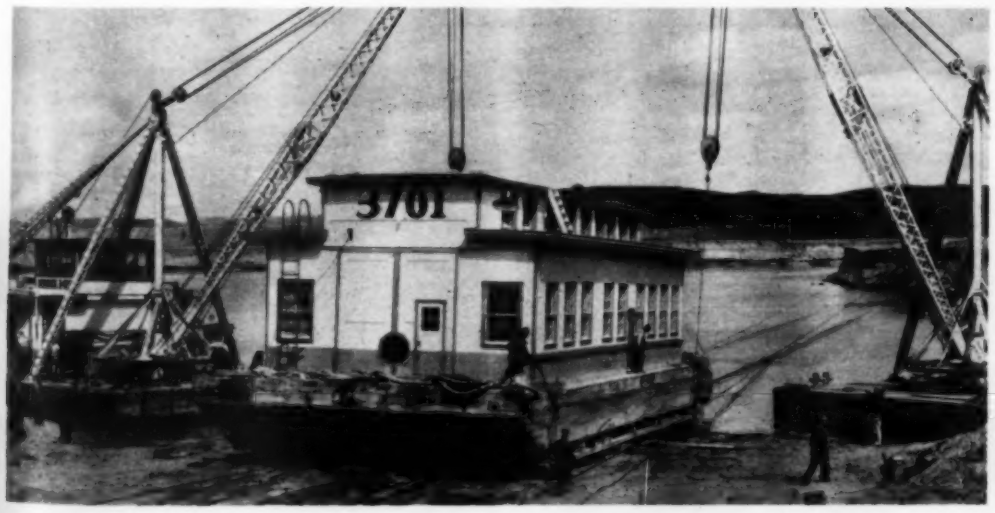
Volume 20 **August, 1938** Number 8

START OF TRIP was made by pulling 150-ton pump barge up wooden skids from core pool of dam at Fort Peck, Mont.

FOURTEEN DIESEL TRACTORS haul 150-ton barge on 1¾-mi. trip overland from core pool at Fort Peck dam to downstream borrow pits along Missouri River.

TRACTOR FLEET

Hauls Barge Overland



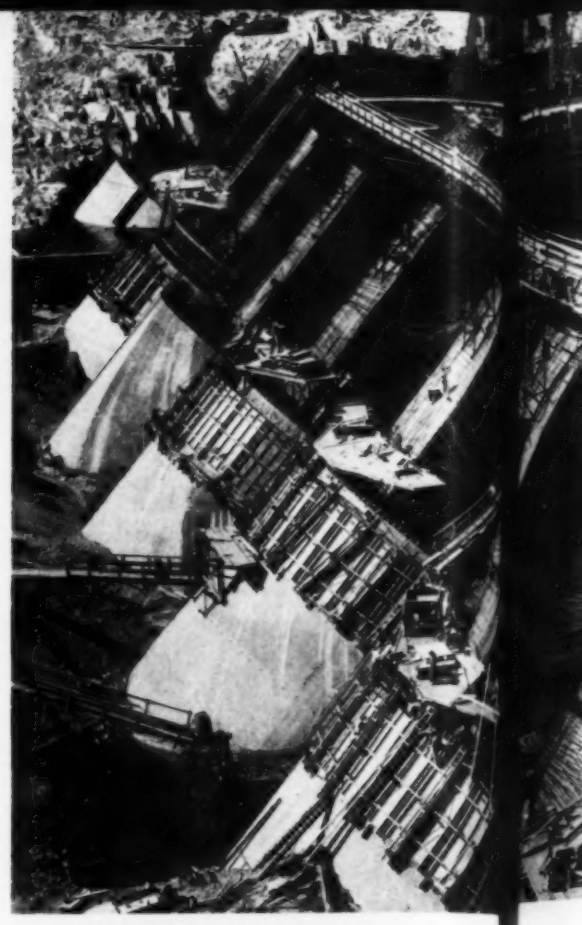
JOURNEY'S END occurs as pump barge is launched into Missouri River, below Fort Peck dam, to serve as booster to dredge.

HAULED OVERLAND 1¾ mi. by a fleet of 14 crawler-type diesel tractors (four 90-hp., nine, 75-hp. and one, 50-hp.), the first of the four pump barges to leave the core pool of Fort Peck dam started its journey early this summer by land from the top of the present earth fill to the downstream borrow pit, where it is used as a floating booster. This piece of plant was constructed at Fort Peck by the Army Engineers early in 1937, and equipped with a 2,500-hp. centrifugal pump of the same type used on the dredges and boosters. Since closure of the old Missouri River channel in June, 1937, the barge has been used for pumping waste water from the core pool in the dam.

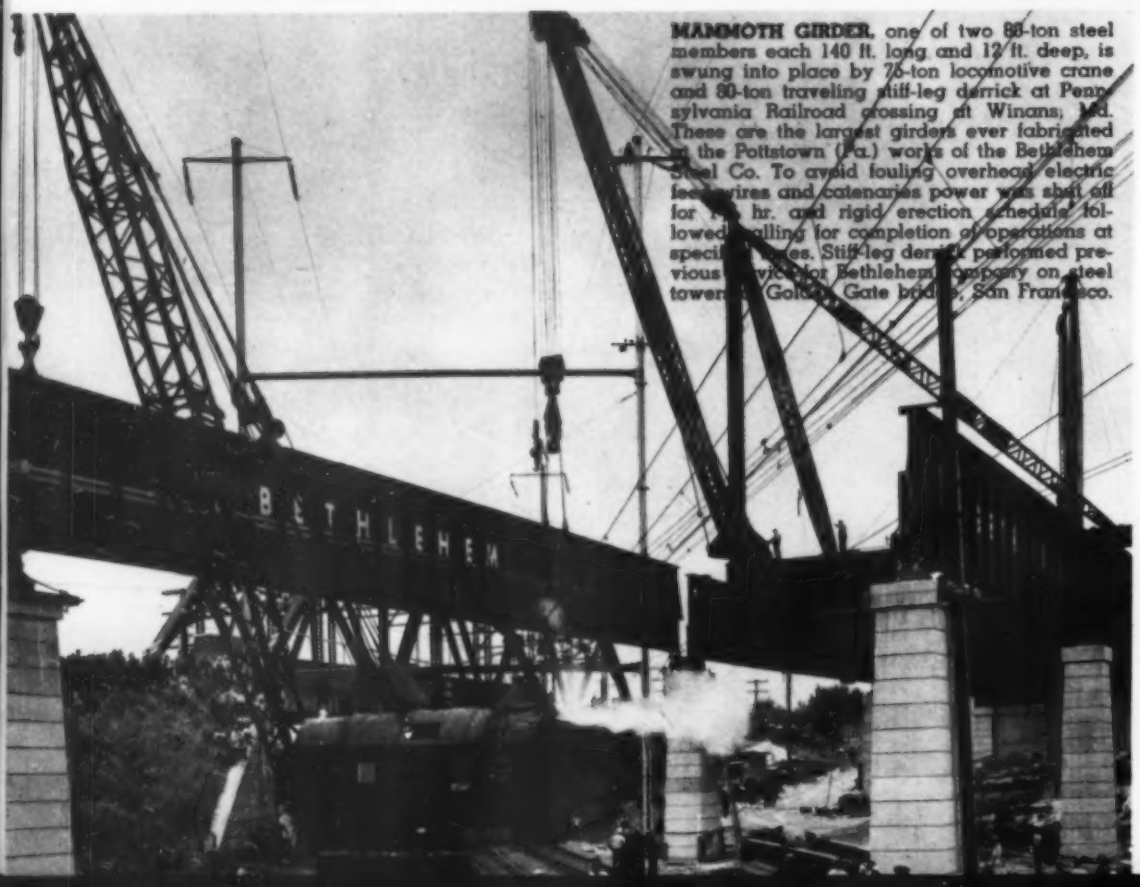
On April 30 the barge, weighing 150 tons, was taken from the water and pulled up the skidways to a point on the left abutment near the dam axis for transfer to the lower borrow pit 1¾ mi. distant.

DEEP PIERS, six in number, are under construction at Baton Rouge, La., by Kansas City Bridge Co., at contract price of $2,421,980, to form substructure of Mississippi River bridge, with main structure 3,326 ft. long, including two 848-ft. cantilever spans, and approaches 8,900 ft. in length. Caissons for piers are sunk to maximum depths of 180 ft. below river surface inside of artificial sand islands retained by steel sheetpiling.

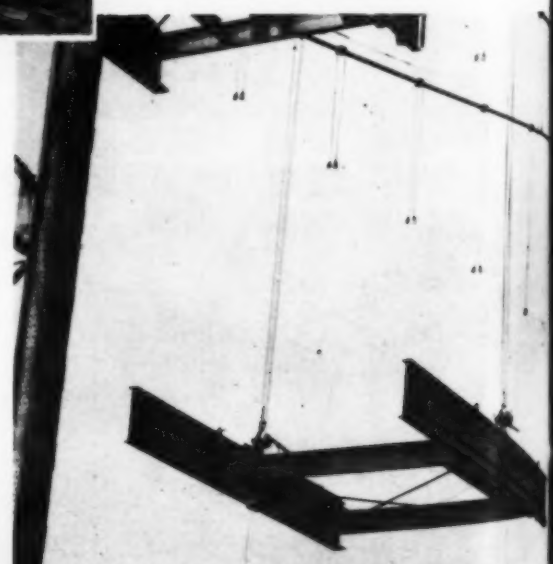
This Month's
"NEWS REEL"



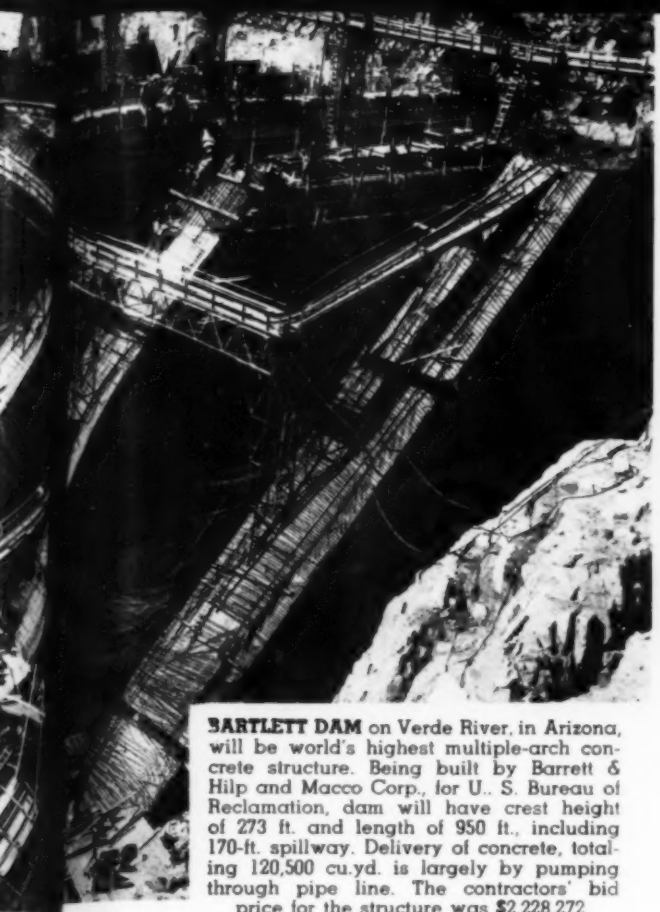
FORT PECK DAM (left) on Missouri River at Fort Peck, Mont., is world's largest hydraulic earth fill, containing, when completed, 100,000,000 cu.yd., and measuring 9,000 ft. long, 242 ft. high above river bed, and nearly 3,000 ft. thick at base. On July 1, a total of 95,307,100 cu.yd. of the hydraulic fill had been placed in the huge barrier being built by the U. S. Engineer Department. Points of interest in accompanying photograph (looking west) are: (1) Pump barge for core pool; (2) two sets of shafts for control works; (3) pipe lines from dredges discharging into core pool; (4) core pool; (5) earth dike section 11,500 ft. long; (6) construction camp at Fort Peck; (7) land booster pump on dredge lines; (8) rock facing on upstream face of hydraulic fill dam.



MAMMOTH GIRDER, one of two 88-ton steel members each 140 ft. long and 12 ft. deep, is swung into place by 75-ton locomotive crane and 80-ton traveling stiff-leg derrick at Pennsylvania Railroad crossing at Winans, Md. These are the largest girders ever fabricated in the Pottstown (Pa.) works of the Bethlehem Steel Co. To avoid fouling overhead electric feeder wires and catenaries power was shut off for [illegible] hr. and rigid erection schedule followed calling for completion of operations at specified times. Stiff-leg derrick performed previous service for Bethlehem Company on steel towers of Golden Gate bridge, San Francisco.



SECTION OF DECK STRUCTURE is hoisted to place for 800-ft. cable suspension main span of Thousand Islands bridge crossing American channel of St. Lawrence River between United States and Canada. As described elsewhere in this issue, the 8½-mi. international crossing includes five separate bridges, scheduled for official opening to traffic on Aug. 18.



BARTLETT DAM on Verde River, in Arizona, will be world's highest multiple-arch concrete structure. Being built by Barrett & Hilp and Macco Corp., for U.. S. Bureau of Reclamation, dam will have crest height of 273 ft. and length of 950 ft., including 170-ft. spillway. Delivery of concrete, totaling 120,500 cu.yd. is largely by pumping through pipe line. The contractors' bid price for the structure was $2,228,272.

MERRITT PARKWAY, forming important traffic link in Connecticut as relief route for Boston Post Road between New York City and Boston, Mass., is officially opened June 29 by Governor Cross, of Connecticut. Section just completed is 15.9 mi. long, extending from Hutchinson River Parkway at New York-Connecticut state line, to Route 123, near Norwalk, Conn. Roadway consists of two 26-ft. lanes separated by grass-covered center strip. Route, to have ultimate length of 38 mi., involves construction of 70 bridges at crossings.

FIRST PILE for General Electric Co.'s building at New York World's Fair, 1939, is driven into earth at Flushing Meadow site while (left to right) GROVER A. WHALEN, president of Fair, and OWEN D. YOUNG, G.-E. board chairman, watch C. E. WILSON, G.-E. executive vice-president, fasten foot-long copper tube "cornerstone" near bottom of 90-ft. timber.

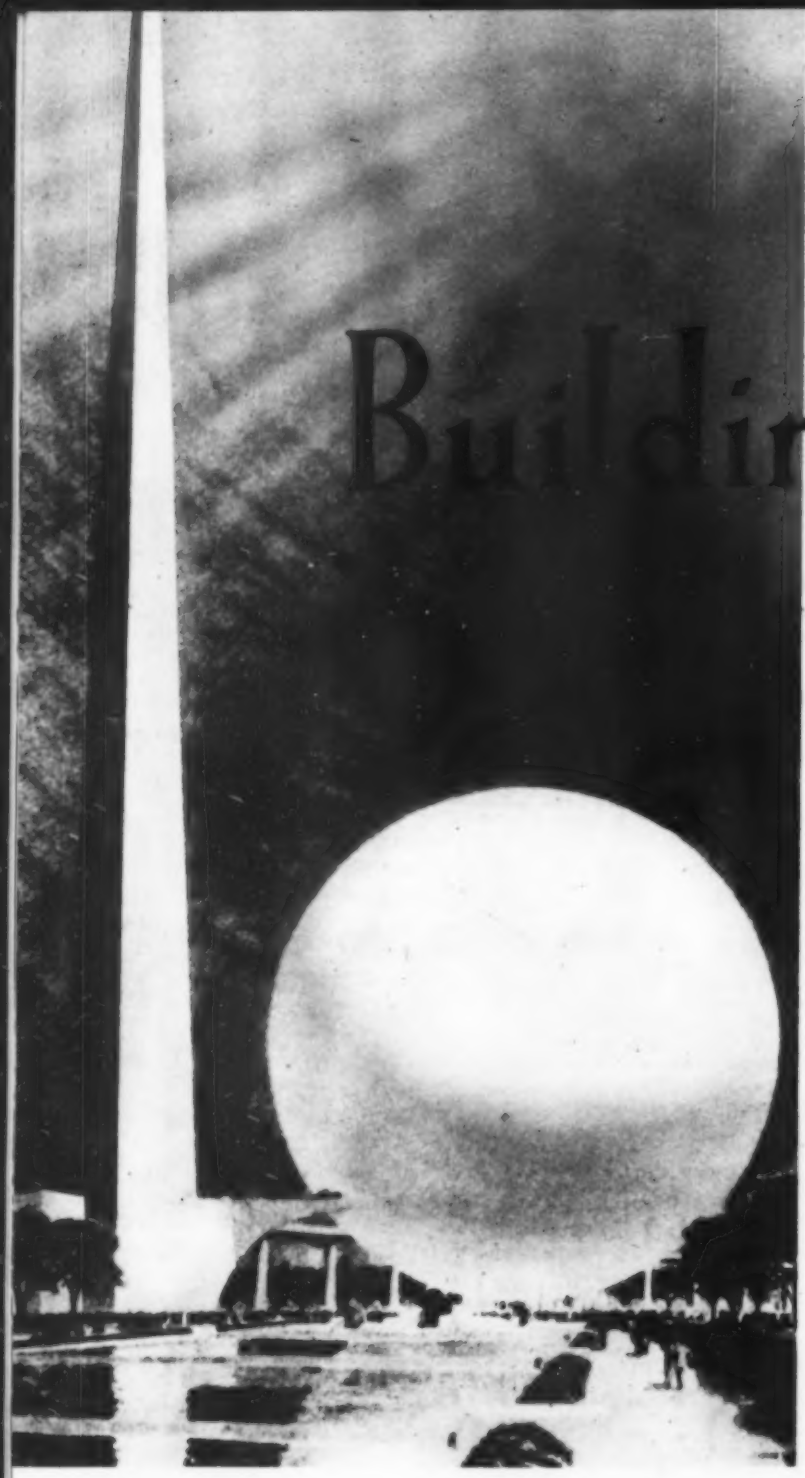
THEME STRUCTURES of New York World's Fair, 1939, 200-ft.-diameter Perisphere and 700-ft. high Trylon, form background for official visit by President Roosevelt, June 30, when he laid cornerstone for Federal Building on Flushing Meadow exposition site.

Wide World Photo

Acme Photo

NEW GALVESTON CAUSEWAY in Texas nears completion as PWA project. With 40-ft. roadway and 2½-ft. sidewalks, this 8,195-ft. long structure, built under direction of Texas Highway Department, provides needed traffic relief for 10,000 vehicles that visit island daily.

Building the World of

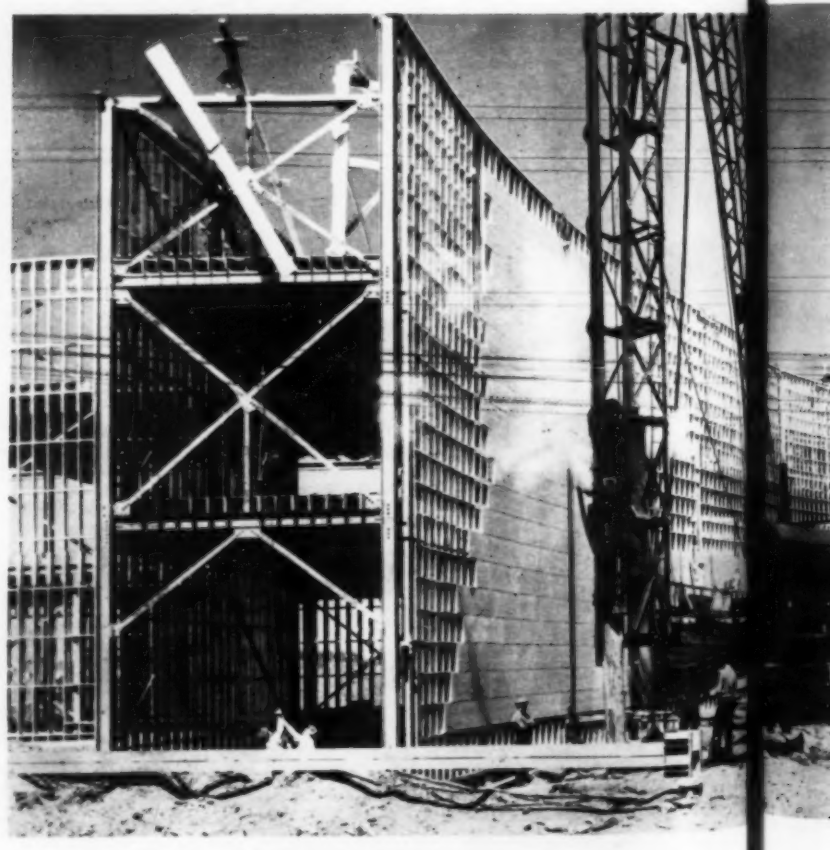


SAFETY, STABILITY AND ECONOMY, with good appearance guaranteed for two years, are the requisites governing building construction at Flushing Meadow Park, New York City, where the New York World's Fair 1939 Inc., its lessees and concessionaires, are well along on the final twelve-month of construction preparatory to opening the exposition on April 30, 1939, 150 years after the inauguration of President George Washington. Strict enforcement by the Fair's Construction Department of a special building code, drafted by the Fair and approved by the City under authority granted by the State, assures adequate safety, comfort and convenience for the occupants and users of all temporary structures erected for the duration of the exposition. The provisions of the code can be carried out within cost limits which are reasonable and economical for buildings of short, concentrated service life. All temporary structures must be razed to 4 ft. below park grade immediately after the close of the Fair's second year, Nov. 1, 1940.

"Building the World of Tomorrow," as the Fair has officially defined its broad theme, imposes upon designers of the buildings new problems in forecasting architectural trends which are most likely to satisfy the taste of dwellers in a machine age. Underneath the imaginative outlines and coloring of their creations, one finds the structural designs adhering pretty closely to established forms which can be relied upon to furnish the safety, utility and economy that must be attained in temporary exposition buildings. Adherence to structural designs of proved worth does not prevent the architects and engineers from introducing new materials and structural practices which were not ready for use when the last great exposition buildings in this country were erected.

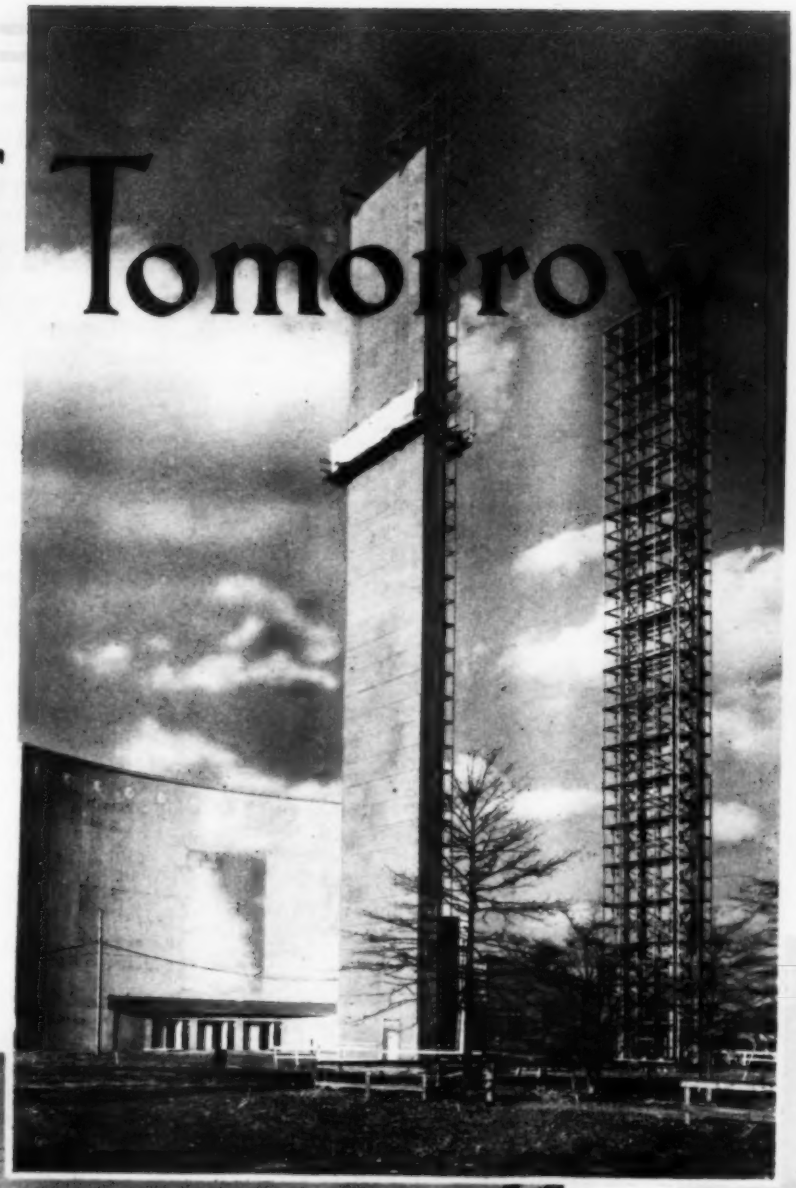
Because the Fair is a semi-public enterprise the corporation endeavors (1) to give every manufacturer an opportunity to demonstrate his materials and (2) to admit for competitive bidding as many different products as possible. The Construction Department in its test building attempts to get a full year's exposure of test samples before using materials or paints. When experience on new products is not available at the site, the engineers visit other similar projects to get all procurable data.

Design Features — By way of a quick preliminary survey, it may be said at the start that Fair buildings (as distinguished from buildings of private exhibitors) in general have only one floor, are devoid of windows, rest on wood piles or spread footings, have bolted steel frames and wooden studding, are sheathed with plaster board which is faced with stucco on welded wire lath, and are covered on the inside with plaster board having aluminum foil insulation against the studs. Both outside stucco and inside plaster board are painted. Roofs are fairly flat, pitched not less than ¼ in. per foot, have a main support of steel roof trusses, girders and beams on which wooden beams and rafters rest. On the framing is placed fir sheathing and fiber insulation board covered with a built-up roofing. Furred ceilings are hung from the roof frame, sheathed with

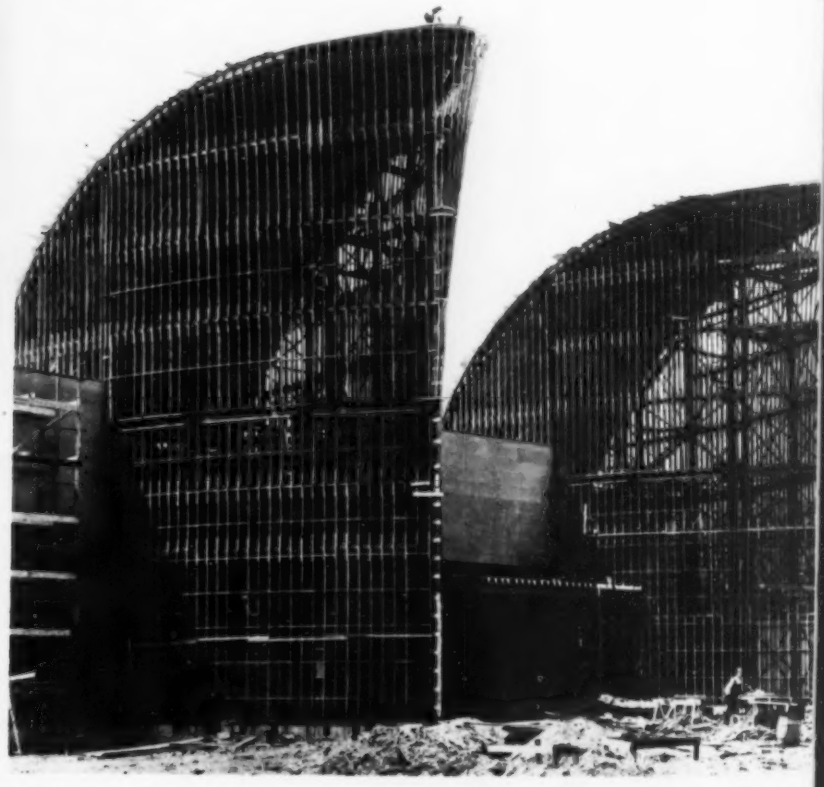


GYPSUM WALL-BOARD (above) ½ in. thick with V-shaped horizontal joints laid to weather sheathes exterior wall of Consolidated Edison Co. Building. Creosoted wood sheathing, waterproofed, will be used below grade.

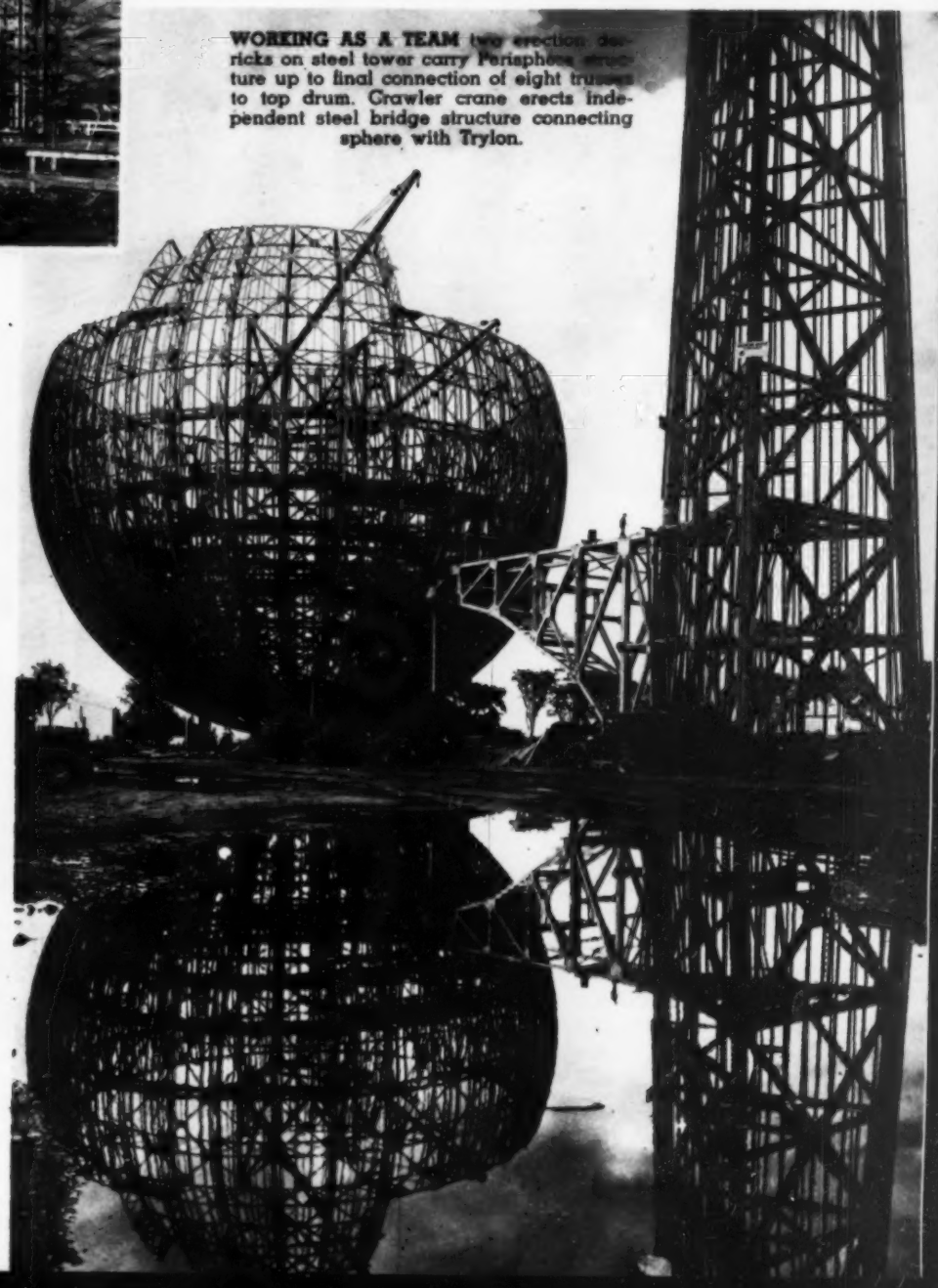
# of Tomorrow



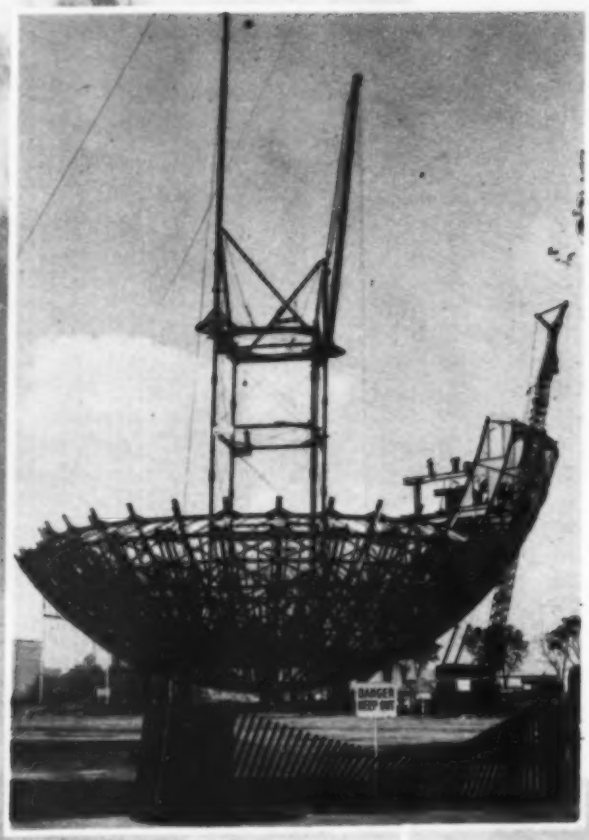
TWO SHIPS' PROWS at entrance of Marine Transportation Building show application of standard wood studding to special steel frame. Note jack holes in concrete footings.



WORKING AS A TEAM two erection derricks on steel tower carry Perisphere structure up to final connection of eight trusses to top drum. Crawler crane erects independent steel bridge structure connecting sphere with Trylon.



TWIN PYLONS (inset, above) 150 ft. high in front of Communications Building have bolted steel frames and enamel-on-steel facing, supplemented by vertical lines of translucent molded plastic (not yet erected) behind which lights will be placed.

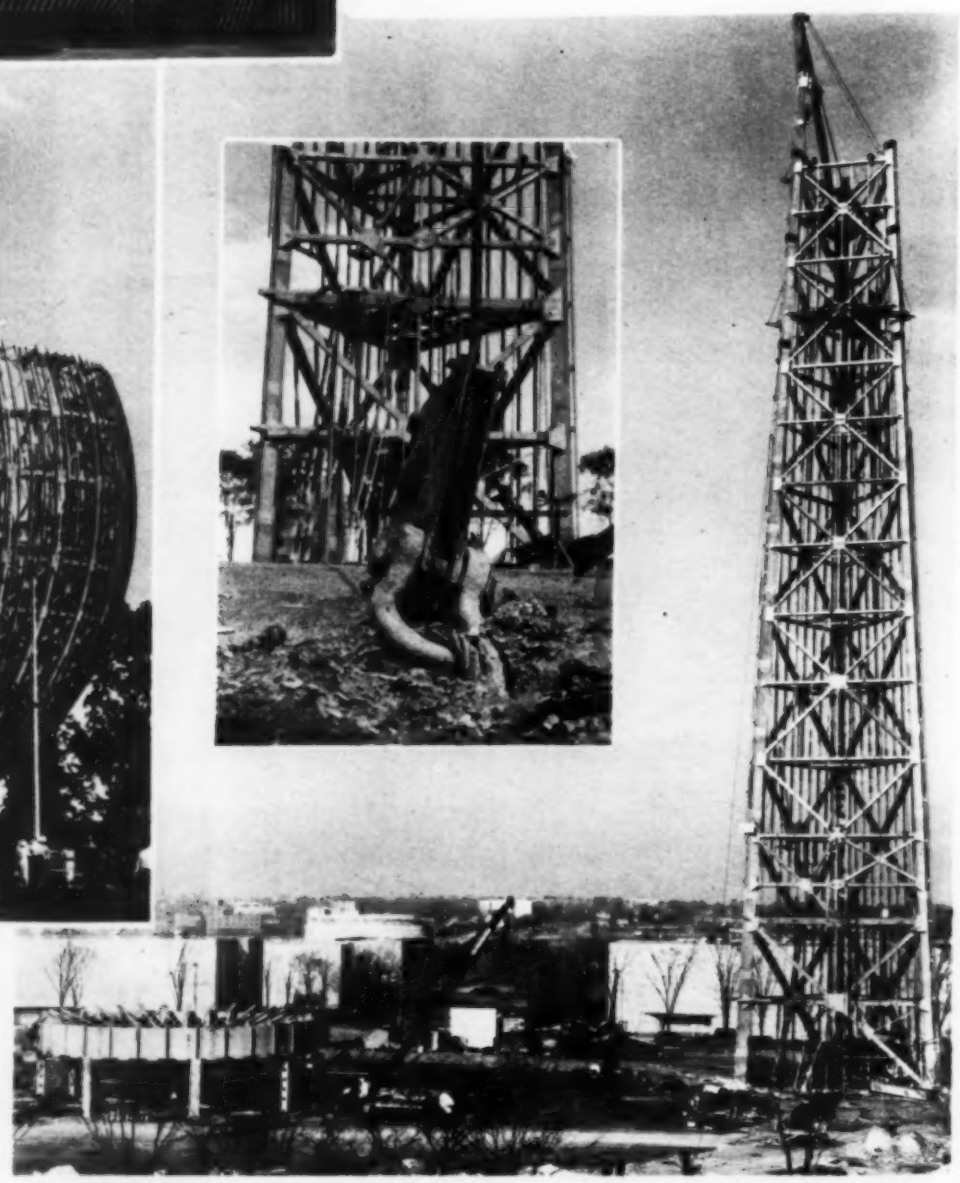


CRAWLER CRANE (left) on ground erects Perisphere steel up to equator. Openings in plate sections of trusses provide for catwalks. Two stiff-leg derricks on 100-ft. erection tower will start setting steel when half-way mark is reached.

plaster board and insulated, in the few cases where insulating board is not used on the roof, with rock wool on top of the plaster board. Lighting is artificial, indirect and designed to aid inspection of exhibits. As the buildings are open only from April 30 to Nov. 1, no heat is supplied in Fair structures. Ventilation is furnished by exhaust fans.

Soil Conditions — In preparing 1,216½ acres in Flushing Meadow for the Fair site the City of New York first graded the area, spreading huge dumps of ash refuse over the marshy meadow. Working night and day with power shovels and pneumatic-tired hauling equipment, the Arthur A. Johnson-Necaro Co., contractor, moved 7,000,000 cu.yd. of material in 9 months. Thickness of the ash crust on the marsh muck determines the type of foundation used under Fair buildings. Where the crust exceeds 30 ft. in thickness, spread footings ordinarily are practicable. For lesser thicknesses, the de-

STEEL SKELETONS of theme structures, Trylon and Perisphere, approach completion at central point of exhibit area. Booms of erection derricks are tied up for Sunday rest while public is admitted to view progress inside Fair grounds.



BASKET BOOM in Trylon tower sets column section. At left is Perisphere ring beam 8 ft. deep and 72 ft. in diameter resting on eight steel columns. Note meridian trusses (32 in number at bottom of sphere) with upper and lower chords clearing ring beam and converging on central drum, to which they connect. **TOPPING LIFT GUY (inset)** passes through anchor sheave attached to dead man at some distance from Trylon.

signs call for timber pile foundations.

Theme Center—At the focal point of the central exhibit area of 390 acres, where construction has been most active and has produced the most conspicuous progress to date, stand the 700-ft. Trylon and 200-ft. diameter Perisphere, a pair of huge geometrical structures selected by the designers to express the theme of the exposition. Names of the two structures are coined words chosen to describe the shape and purpose of the monuments. The Trylon (or three-sided pylon) is a tall tetrahedron tapering from an equilateral triangle measuring 63 ft. on a side at the base to a point 700 ft. above the bottom of the foundation. Its concrete piers rest on 597 creosoted Douglas fir piles more than 90 ft. long.

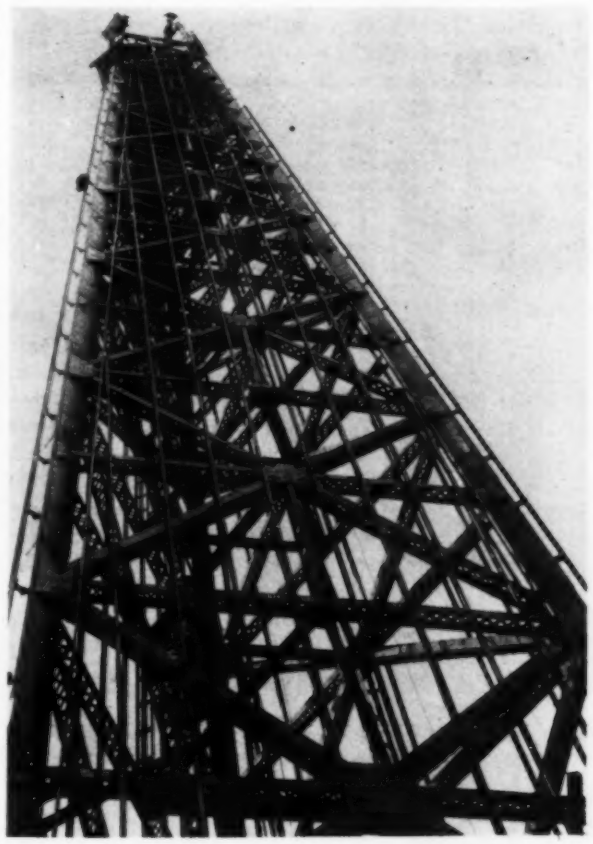
For a height of 500 ft. the Trylon has a structural steel frame. The exterior of the tower will be faced to this elevation with stucco. Above the 500-ft. level, to its peak, the tetrahedron has a self-supporting exterior sheathing of riveted steel plate, erected flush with the stucco facing below it. Both steel plate and stucco will be painted. Weight of steel in this structure is about 1,000 tons.

Alongside the tall Trylon is the 200-ft.-diameter Perisphere, designed to sustain a total estimated load of more than 4,000 tons, of which 2,000 tons is in the structural steel frame. The sphere will be completely inclosed in painted stucco. Inside its huge interior spectators will gaze from a moving circular platform upon a vast panorama.

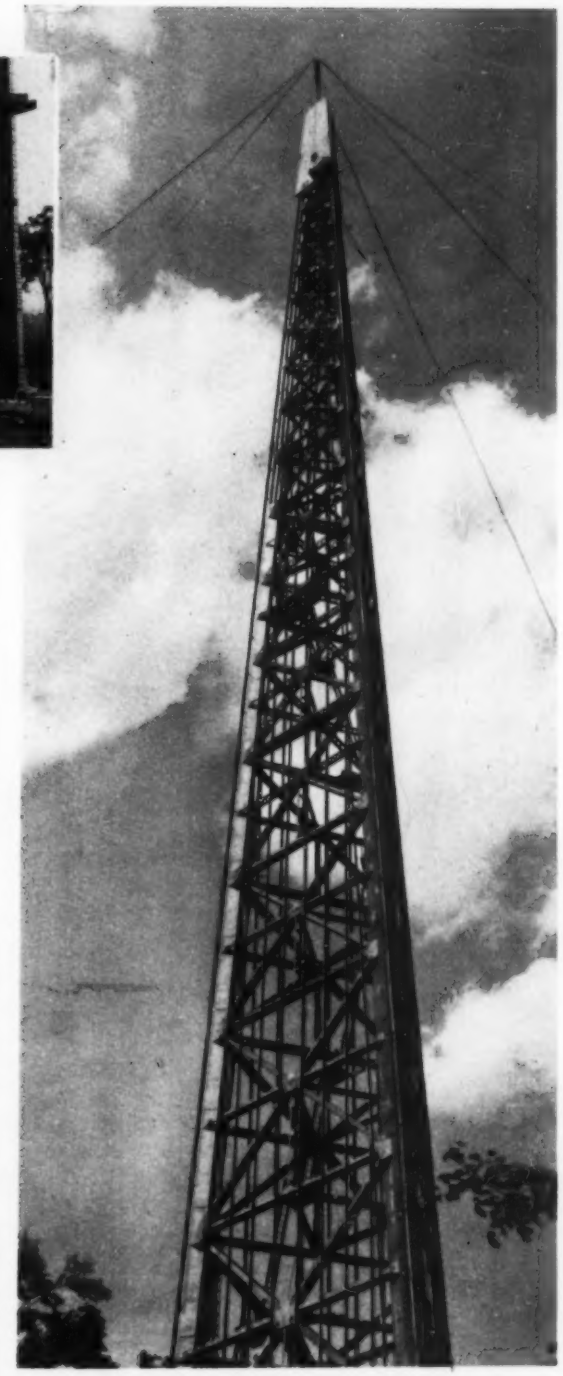
Eight columns 3 ft. thick and 16 ft. high, spaced around a circle 72 ft. in diameter, support the Perisphere. The columns will be incased in glass cylinders, inside which pumped water will rise, creating the illusion that the great sphere is riding on water jets. Under the concrete foundation ring are 548 creosoted Douglas fir piles more than 90 ft. long.

Steel Erection — A $659,450 contract for the erection of 3,000 tons of steel in the Trylon and Perisphere is being executed by the American Bridge Co. A basket boom 70 ft. high erected the Trylon steel. Column steel came in sections varying from 19 to 33 ft. long, and struts were spaced 10 to 30 ft. apart. The boom was equipped, as erection advanced upward, with three topping lift guys reeved through anchor sheaves about 250 ft. from the tower to the drums and niggerheads of a 100-hp. three-drum hoist engine and an auxiliary single-drum engine. One drum was kept free for the load line. Jumping guys ran down the inside of the Trylon legs to sheaves tied near the base. These guys were operated by the niggerheads. Steel-plate sections, averaging about 30 ft. to a tier, were erected by the same type of equipment.

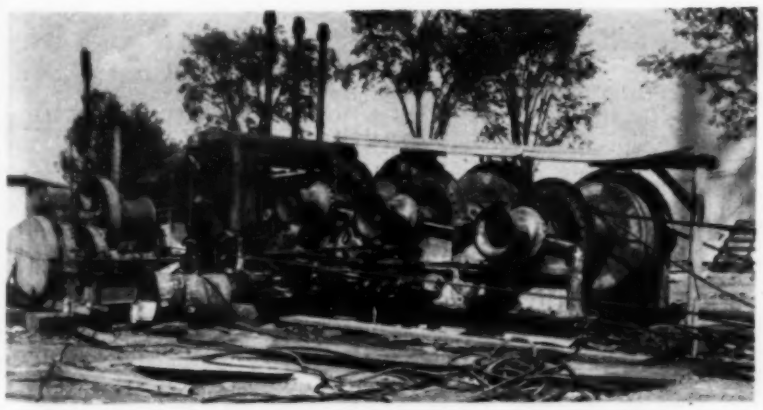
JUMPING GUYS come down inside tower legs to sheaves anchored near bottom. Guys are spliced into single line for unit operation.



TRYLON STEEL STRUCTURE carries purlins to which wood frame will be attached to support sheathing and stucco.



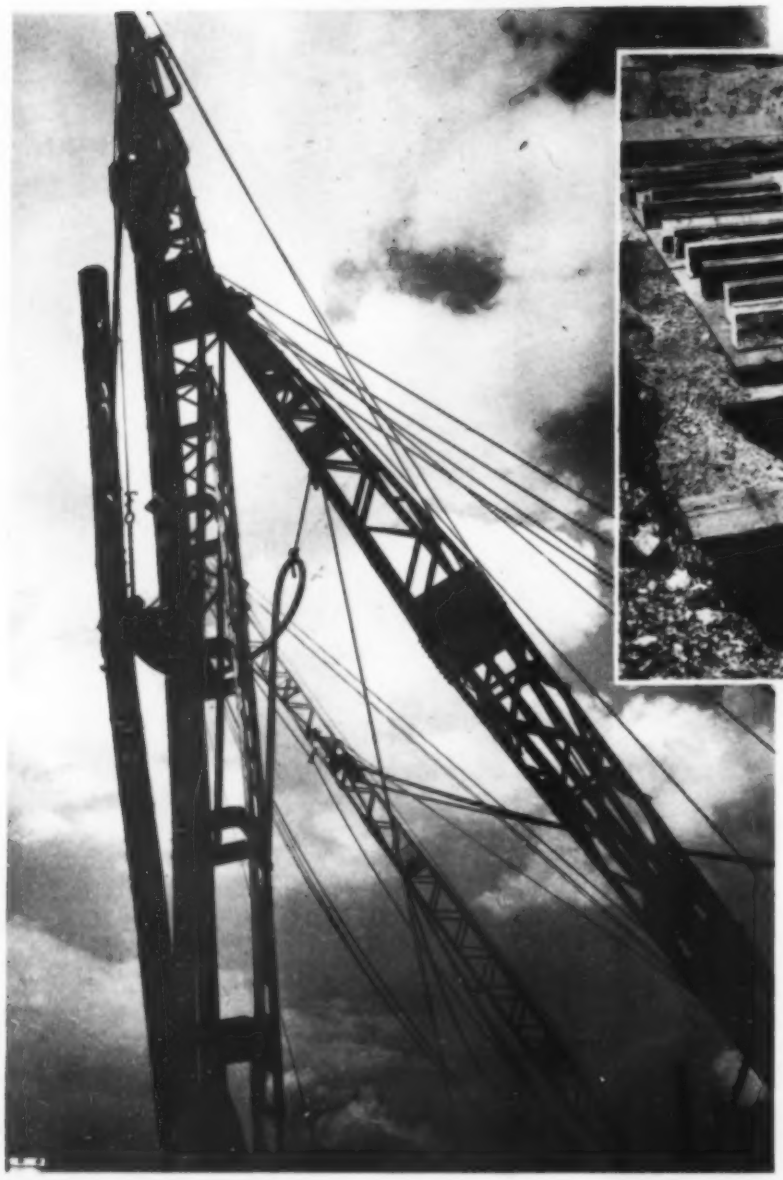
STEEL-PLATE SECTION at top of Trylon is erected by basket boom equipped with additional guys.



THREE-DRUM HOIST ENGINE and smaller auxiliary hoist engine operate load line and three topping lift guys of basket boom. Jumping guys are operated on niggerheads.

Structural steel for the Perisphere was erected up to the equator, or half-way mark, by a 30-ton Speed-crane carrying a 100-ft. boom and a 12-ft. jib. To carry erection above the equator, the contractor erected on the bottom structural diaphragm of the Perisphere a square steel tower, with legs about 30 ft. apart, reaching 100 ft. into the air. Two stiff-leg derricks set on diagonally opposite corners of the tower erected the upper half of the sphere with 100-ft. booms. Two three-drum 100-hp. hoists operated the stiff-leg derricks.

Extent of Building Work — Estimates of the total cost of the Fair have been twice revised upward to the present figure of $150,000,000. The Fair corporation is erecting 21



TIMBER SPREAD FOOTINGS of Gas Exhibits Building use mat of 3x10-in. planks to support 6x8-in. crosspieces on 21-in. centers under 12x14-in. beam (in foreground), all of yellow pine. Allowable load under these footings is 1,000 lb. per square foot.

TIMBER PILES are foundation supports for all engineering structures and for buildings where ash crust is not thick enough to make spread footings safe. Rodgers & Hagerty drive 75-ft. wood piles in eleven-cell cofferdam under tide gate in Flushing River to keep tidewater out of lake and lagoon system.

STEEL GRILLAGES on timber spread footings support concrete piers of Consumer Building.

huge exhibit buildings, and 38 private exhibitors are putting up structures of comparable size. In addition, numerous buildings are being erected by Federal, State, City and foreign governments. The New York State and New York City buildings are to be permanent features of Flushing Meadow Park and, consequently, are designed for long life. All other structures are destined for demolition after Nov. 1, 1940, in accordance with the agreement under which the City leased the park to the corporation.

To operate the Fair will require a working population of 50,000 persons, exceeding the working populations of such cities as Richmond and Hartford. Functional requirements of the exposition make necessary public utilities equal to those of Portland, Ore. Buried beneath the graded and landscaped surface of the Fair grounds are 13 mi. of gas mains, 15 mi. of electrical ducts, 30 mi. of sewers and 15 mi. of water mains.

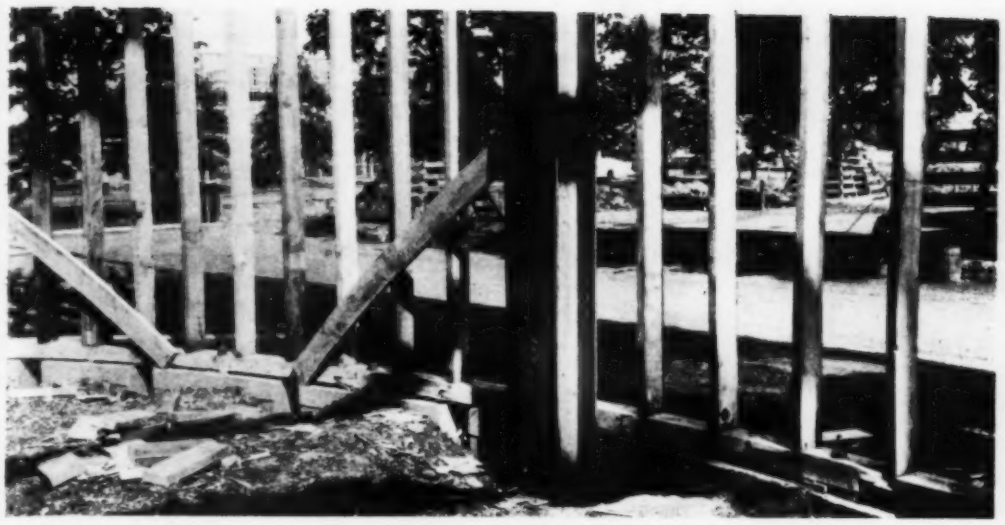
Quantities of materials for buildings of private exhibitors cannot be estimated at present, but a few of the materials going into Fair structures alone can be gaged roughly. It is estimated that Fair buildings will take 4,000,000 lin.ft. of foundation piles, 30,000,000 b.ft. of lumber, 22,500,000 sq.ft. of wall board and 115,000 tons of concrete and stucco materials.

Building Code — By act of the State legislature the City was empowered to enact a special building code prepared by the New York World's Fair 1939, Inc., covering all temporary structures erected on land leased by it from the City. The code sets up conservative standards for construction and gives due consideration to the safety, utility and economy that must be obtained in temporary exposition structures.

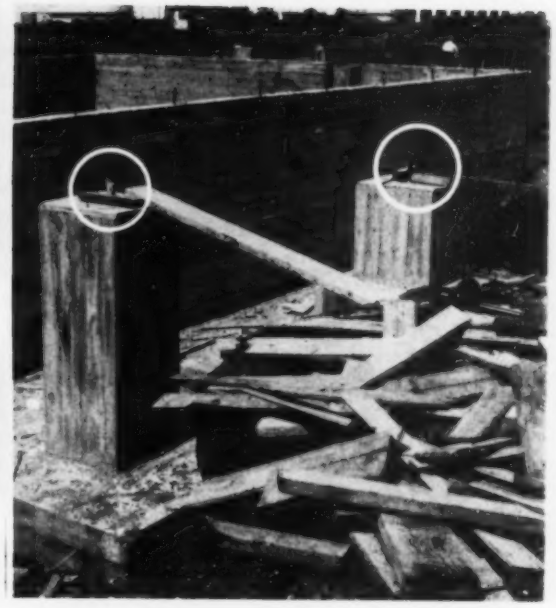
Enactment of the special building code for the New York World's Fair also provides that the Fair corporation is the enforcing body of the code. This provision means that the Construction Department of the Fair is acting as the equivalent of a city's "building department." In addition to guaranteeing conformity to the code of all construction work designed by the Fair, the Construction Department examines and approves all plans designed by private exhibitors. All work must be approved and an official building permit obtained before construction starts.

Practically all buildings fall in the code's Class 5 — fire-retarded structures, in which structural parts and exterior walls are of assemblies having a fire-resistive rating of at least

SIX CONCENTRIC RINGS of creosoted fir piles 85 to 100 ft. long support 4,000-ton load of Perisphere. As special precaution, treated piles are used for this structure and adjacent Trylon because cutoffs are 11 ft. above water table.



TO TAKE UP ANY SETTLEMENT that may occur in future, concrete footings under exterior walls of Production and Distribution Building have openings left in them to permit insertion of jacks. Similarly, steel column has holes already drilled for possible future attachment of brackets or jacking collars.



FOR FUTURE DYNAMITING, paper tubes temporarily reinforced with 2-in. pipe are cast in piers of A. T. & T. Building. These holes will aid demolition to 4 ft. below finished grade after close of Fair

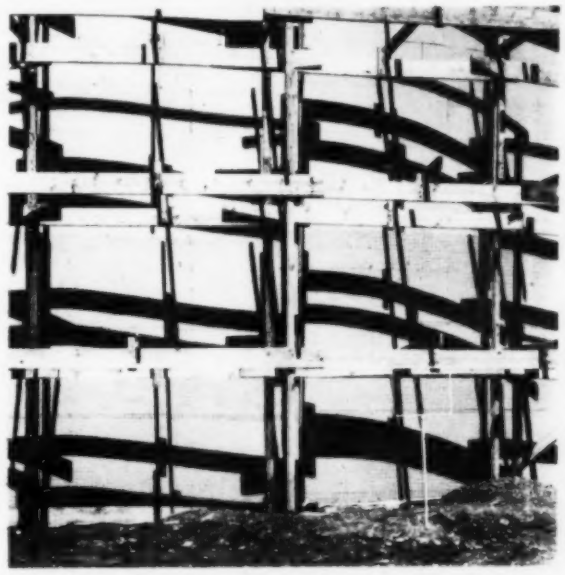
½ hr. With its occupied floor at a maximum height of 3 ft. above grade, the area of a Class 5 building with ½-hr. fire resistive rating is limited to a maximum of 80,000 sq.ft. By increasing the fire-resistive rating to 1 hr. (the occupied floor being a maximum of 3 ft. above grade) the area of the building becomes unlimited.

When a Class 5 building has floors at upper levels, its ground area is limited to 25,000 sq.ft. If designed for private use only, the highest occupied floor may be 35 ft. above grade; where the public is admitted, the maximum height of an occupied floor is 20 ft.

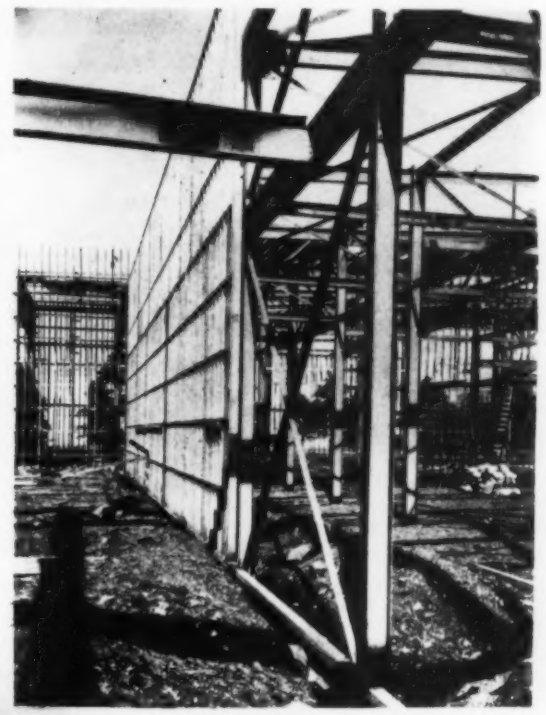
For a fire-resistive rating of ½ hr., a sheathing on both sides of the studs or other structural members of ½-in. gypsum board is sufficient. To obtain a 1-hr. rating the thickness may be doubled by applying two ½-in. layers, or wire lath and stucco may be substituted on either or both sides of the wall.

Some flexibility is permitted in applying the provisions governing Class 5 buildings. Thus, buildings of more than 25,000 sq.ft. with a second occupied floor can be brought under this classification by having the entire second floor and all stairways protected for a 1-hr. rating either with 1 in. of gypsum board or with cement plaster on wire lath. The stairs themselves must be incombustible — usually steel with cement treads.

In the two-story Administration Building, the first unit erected at the World's Fair site, the designers brought the structure literally under



WELDED WIRE MESH in 2-in. squares is nailed to gypsum wallboard to support and reinforce three-coat stucco facing about ⅞ in. thick.



SECONDARY WALL FRAMING of timber sills, studs and plates is fastened to steel spandrel beams of main frame

BUS ROADS (right) designed to carry passenger buses (which will be sole means of transportation for visitors) have crushed stone bases under bituminous concrete wearing surfaces. In left background is stucco exterior of Administration Building, ready for painting in contrasting colors.

the Class 5 specification by dividing the building with firewalls into 25,000-sq.ft. areas and providing incombustible stairways protected by stair wells of 1-hr. rating. Large exhibit buildings equipped with second-floor toilets are kept in Class 5 by furnishing 1-hr. rating and incombustible stairs for the two-story portions of the structure.

When buildings exceed limits prescribed under the code for Class 5 structures, they are required to meet added fire protection standards for higher classifications. Some buildings, because of multiple-story planning, must meet fire-resistant ratings greatly in excess of Class 5 requirements.

All buildings of any size must be equipped with standpipe systems and fire protective devices. In some structures sprinkler systems are required.

Fair Buildings—Structures erected by the Fair conform to the Code and, in addition, observe certain other criteria, such as having only one floor. The paving to be used on these floors, placed on earth or gravel fill, is still the subject of experiment.

Structural steel frames of the buildings in general have curtain walls of plaster board and stucco on 2x6-in. studs spaced at 16- to 24-in. centers between columns. Exterior sheathing ordinarily consists of ½-in. gypsum board in 2x8-ft. sheets. Over the sheathing is nailed welded wire mesh in 2-in. squares to support a three-coat stucco facing. The stucco masons put on a scratch coat and double back in one day, returning for the finish coat later. About ⅞ in. of plain stucco is built up by the three-coat job.

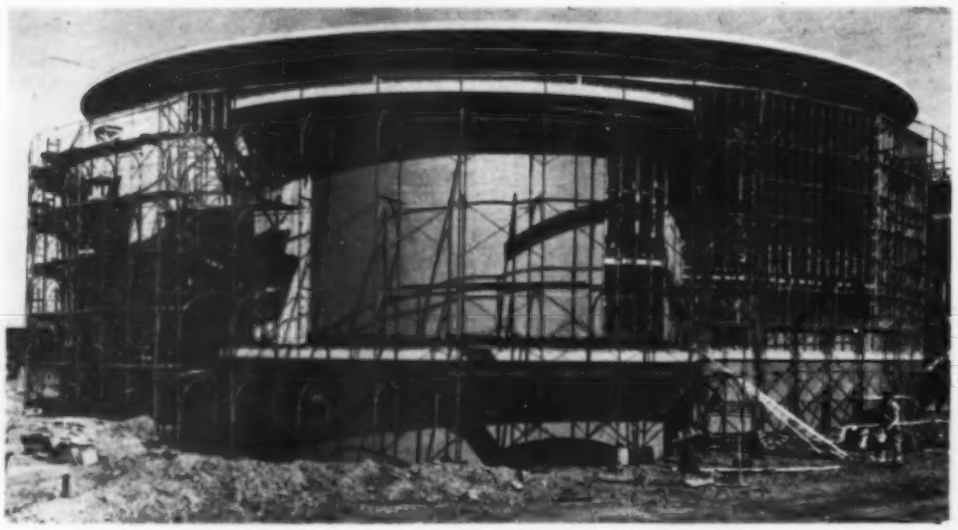
Interior surfacing of outside walls at present consists generally of ½-in. gypsum wall board in 4x8-ft. sheets lined with aluminum foil on the side placed against the studs. Joints between the sheets are filled to make them as smooth as possible before the wall is painted.

In some of the first buildings erected, aluminum foil insulation was used on the outer sheathing of gypsum board, against the studs. In other buildings, foil was eliminated and rock wool insulation was placed in the walls between the studs. Certain buildings too, have shown variations in lath for stucco. One of these buildings used welded wire mesh with inter-woven moistureproof paper backing, omitting the plaster board sheathing, and another used expanded metal lath backed up by gypsum board.

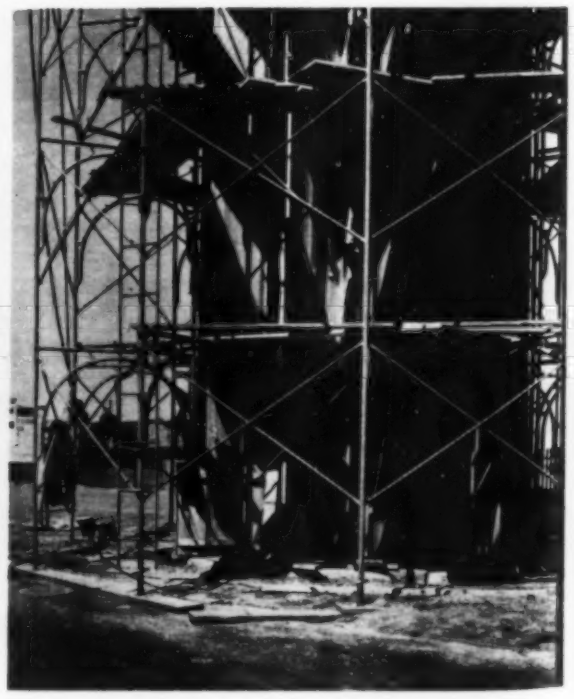
SHOP-RIVETED TRUSSES and connecting girts and purlins are bolted up in field. In background note roof joists resting on upper chord of truss — typical roof framing for Fair buildings.

TRUCK MIXERS deliver concrete to reinforced caps of Trylon foundations, resting on creosoted fir piles. Behind Trylon foundations is reinforced-concrete ring on which eight steel columns of Perisphere will stand.

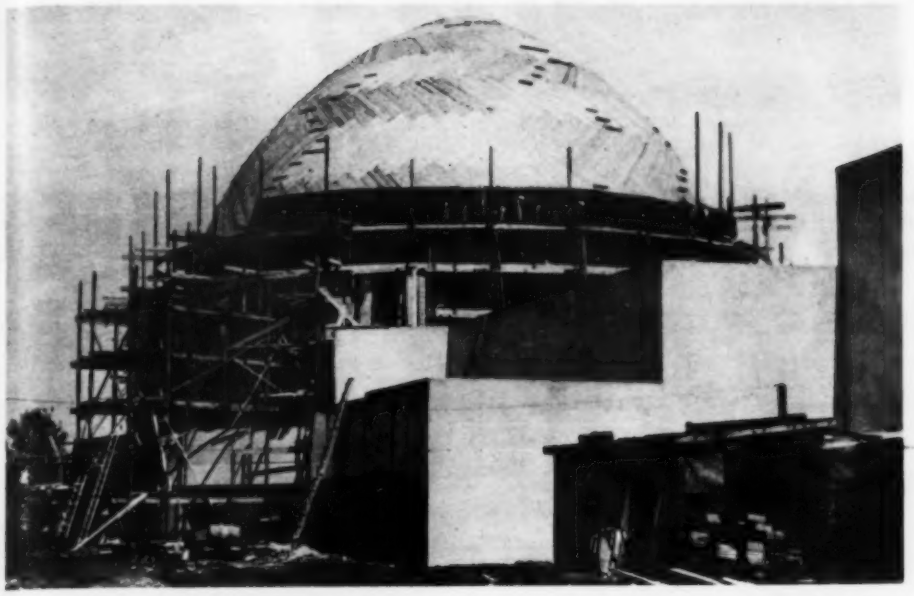
Roofs—Roofs are designed to meet code requirements for fire resistance. On roof frames of wooden beams and rafters supported by steel girders, Fair buildings in general are designed to take ⅞-in. fir sheathing, 1-in. rigid insulation board and three-ply built-up roofing consisting of one layer of



FOR EXTERIOR SHEATHING and stucco work on Johns-Manville Co. Building, A. L. Hartridge Co., contractor, uses light welded tubular scaffold of same type employed by builder of Star Pylon.



WELDED BENTS (right) of tubular scaffolding have vertical pipe-dowel joints and welded bolts for fastening crossbraces with thumbscrew nuts. Decorative wood facing of pylon is finished with raw linseed oil and two coats of spar varnish.



DIAGONAL WOOD SHEATHING on timber frame closes dome on Fisheries Building.

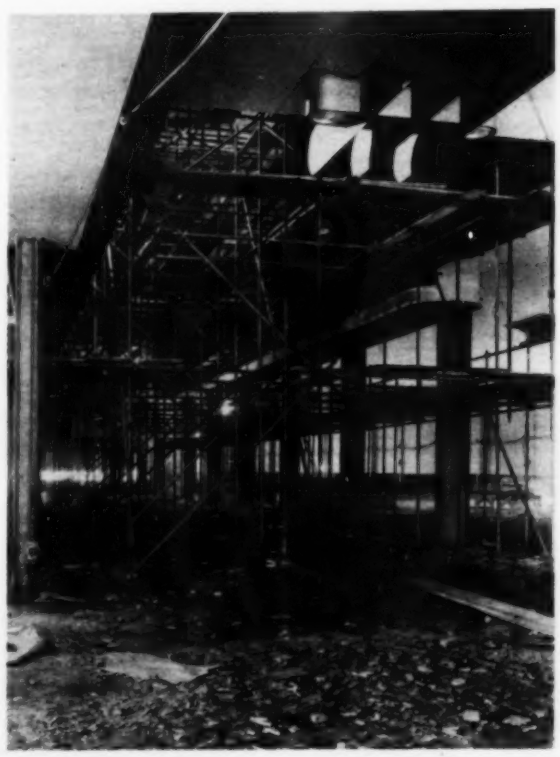
34-lb. felt and two layers of 20-lb. asphalt-saturated asbestos felt. Ceilings of gypsum plaster board are hung from the roof framing. In some of the earlier buildings, where insulation board was not used in the roofs, rock wool was placed above the plaster board in the ceilings.

Painting — In Fair buildings, designed for a maximum life of 2 years, painting is for appearance only and not for preservation. The engineers expect 1 year's wear for each paint job, and the practice is to use a relatively cheap material that experiments and research indicate will hold up for this length of time, when ordinary wear and tear would make it necessary to renew any quality of paint. Experiments and tests by the Construction Department simulate actual exposure experience for outside work.

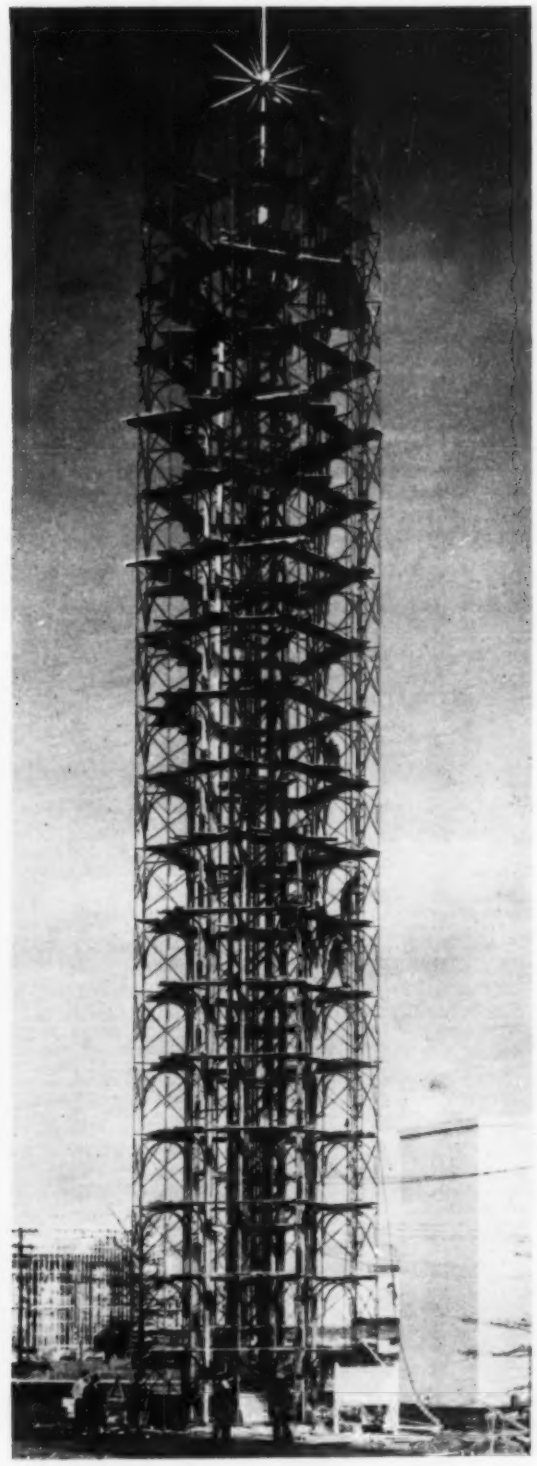
Stucco exterior facing is given a single brushed coat of synthetic resin-water paint. For the delicate and complicated color schemes of the interiors, the builders are applying cheaper wall paints and are finding it necessary to use two coats to get a flat, smooth surface over the joints between the boards. Filling and smoothing the joints has proved something of a problem.

Decorative Materials — In addition to colors applied by painting, the designers are using for decoration stainless steel, bronze, copper and aluminum, enamel on steel, glass block and translucent sheets of molded plastic, to mention only a few. Wood also is being used in certain structures, such as bridges and one pylon, as a decorative material.

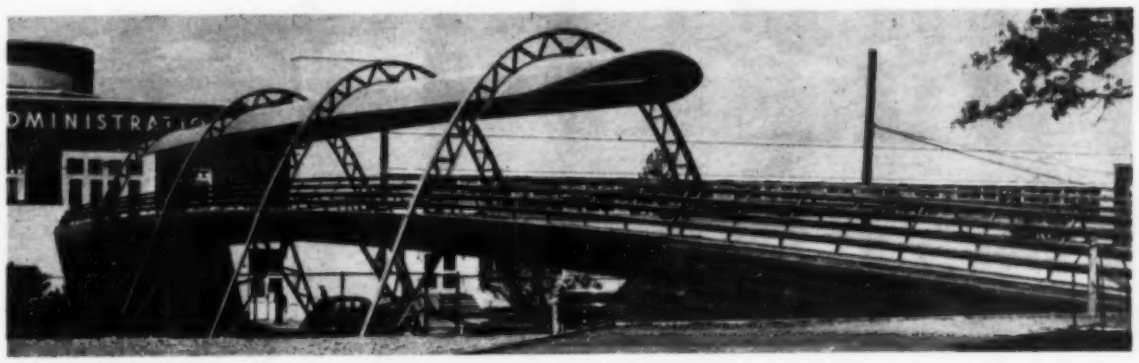
Administration—Under Grover A. Whalen, president of New York World's Fair 1939, Inc., W. Earle Andrews is general manager and Col. John P. Hogan is chief engineer and director of construction.



TUBULAR SCAFFOLDING equipped with special couplers to connect posts, horizontal members and braces carries workers aloft inside high recesses of Textile Building.



STAR PYLON, free standing shaft 115 ft. high with 25-ft. flagpole on top, is faced with wood by Salson Construction Co. using tubular scaffolding in welded units easily and quickly erected and dismantled. Five men erect eighteen tiers of scaffolding for this tower in 10½ hr.



STEEL AND WOOD are used to obtain novel effect in footbridge ramp crossing bus road in back of Administration Building. Curved roof built up of 2½x2½-in. wedge-shaped wood strips nailed at 3-in. centers and glued (with butt joints staggered at quarter points — points of least stress) functions as continuous beam, self-supporting between bents, 40 ft., c. to c., where steel plates shape and hold roof in place. Top is canvas covered.

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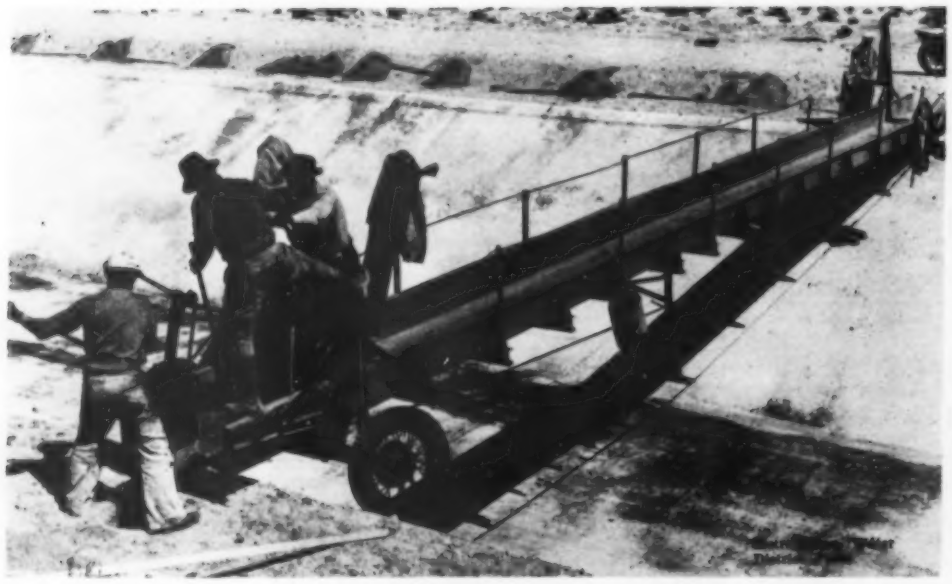
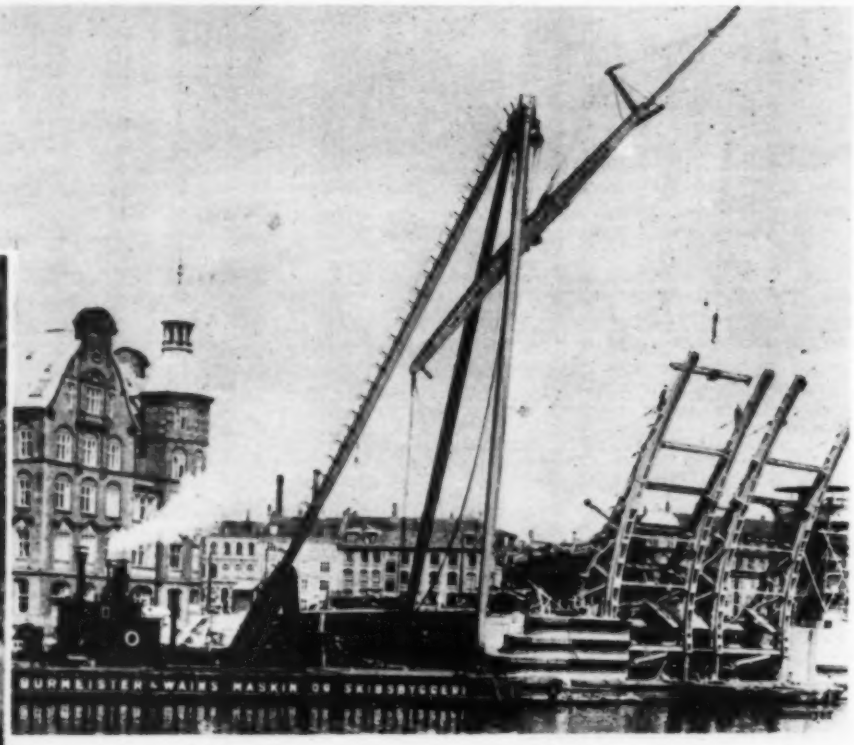


TRAVELING BRIDGE, riding on pneumatic-tired wheels, provides means for carrying across canals of Metropolitan aqueduct in California, buggies of concrete which Pittsburgh Steel Co. deposits in post holes for 154 mi. of fencing being built to protect aqueduct line and reservoir areas. (See **Construction Methods and Equipment**, June, 1938, pp. 56-57).

STOUT CROSS-BRACING of Duff-Norton extensible steel trench braces and timber braces supports heavy earth and water pressure against solid sheeting of trench on contract of John Mowlem & Co., Ltd., in Hoseferry Road, Westminster, London, England, where excavation is carried on within 90 ft. of River Thames.



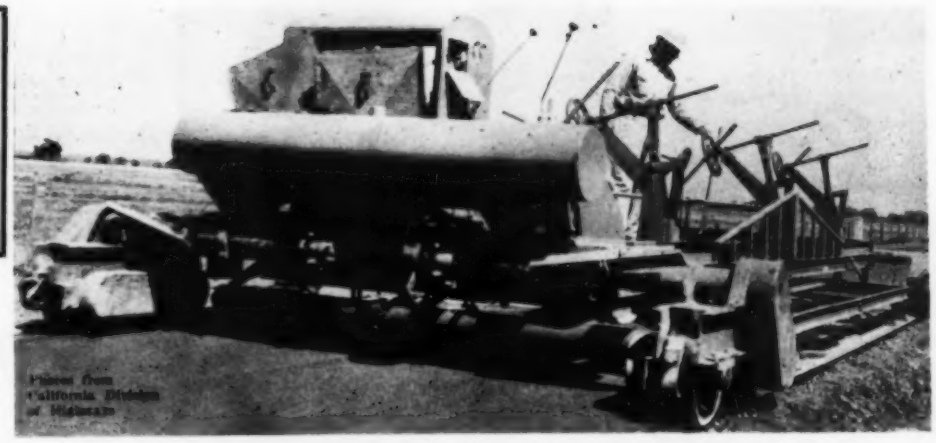
HANGING BOOM, suspended between shear legs of floating tripod, sets steel in bascule leaf of Knippers bridge connecting Copenhagen, Denmark, with Isle of Amager, one of city's suburbs.

CELLAR DIGGING with Cletrac gasoline 27-drawbar hp. tractor and Isaacson bulldozer enables Claude Williams, Seattle, Wash., to move 200 yd. in 8-hr. day at fuel cost of less than 1c. per cubic yard.

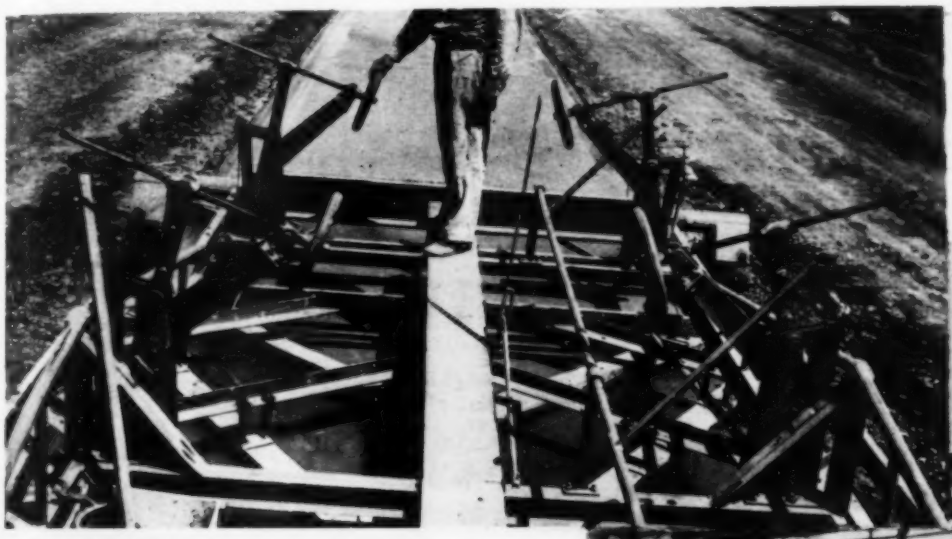
WANTED — Photos of Details

The Editor of Construction Methods and Equipment wants photographs or sketches illustrating interesting DETAILS of method or equipment and will pay for those he finds acceptable for publication.

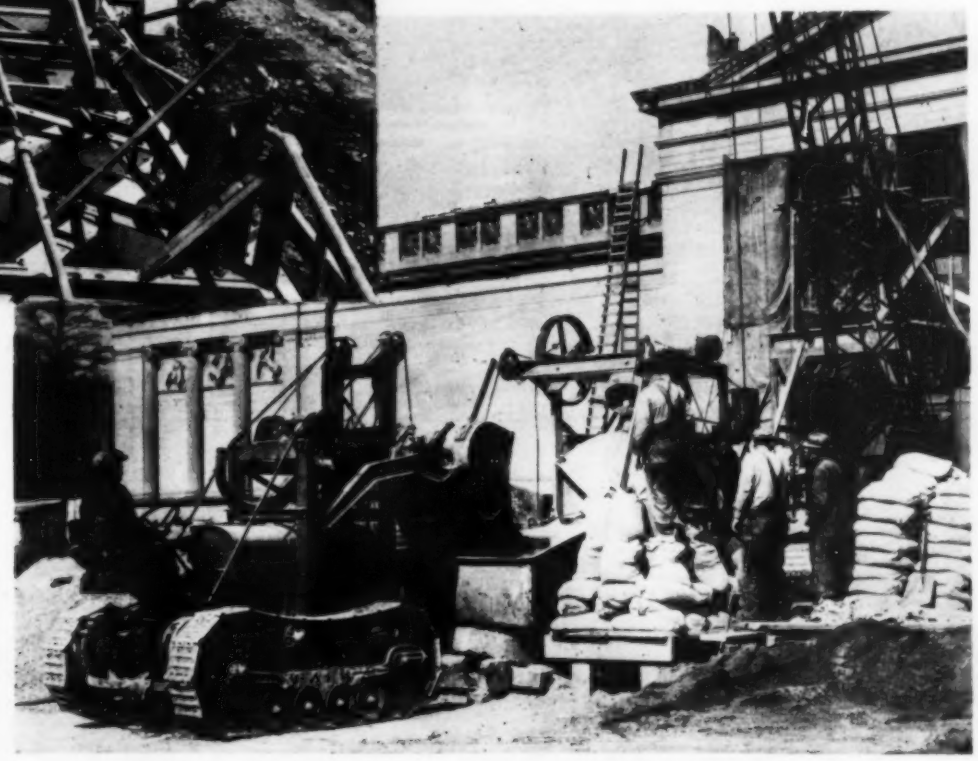
Hasn't your job produced some DETAIL that might be illustrated on this page? Send along a picture of it; we'll return it promptly if we can't use it.



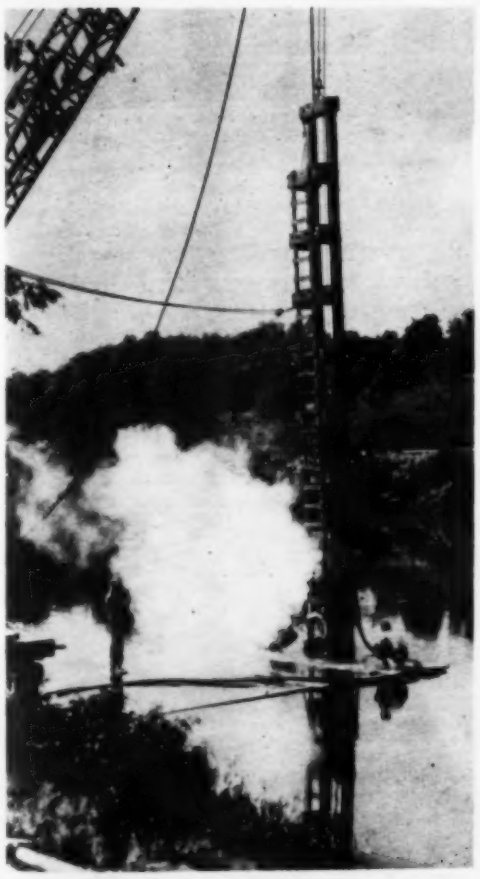
MAHOGANY FLOATS (below) of Johnson finisher are suspended independently and adjusted to pavement crown. Two main floatboards intersect under center of machine, and V-units of floatboard are mounted in angles at three sides of intersection. Machine carries 8-in. roller across front and steel-shod cut float (used only on last pass) and operates in both directions without turning.



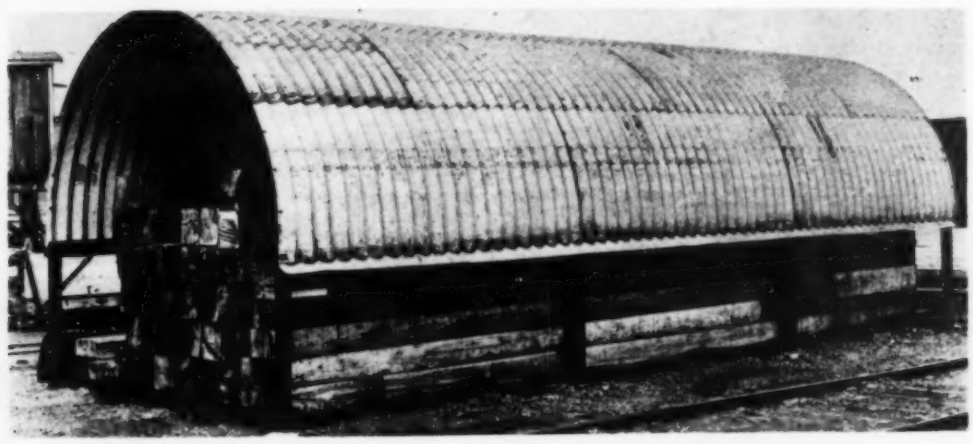
MECHANICAL FLOAT FINISHER developed and tested on concrete paving projects built under contract by California Division of Highways follows regular finishing machine and imparts surface finish that cannot be equalled for smoothness by hand finishing. Operating about one-third of shift, machine (known as Johnson drag finisher) finishes entire output of one paver, ordinarily making six trips over pavement.



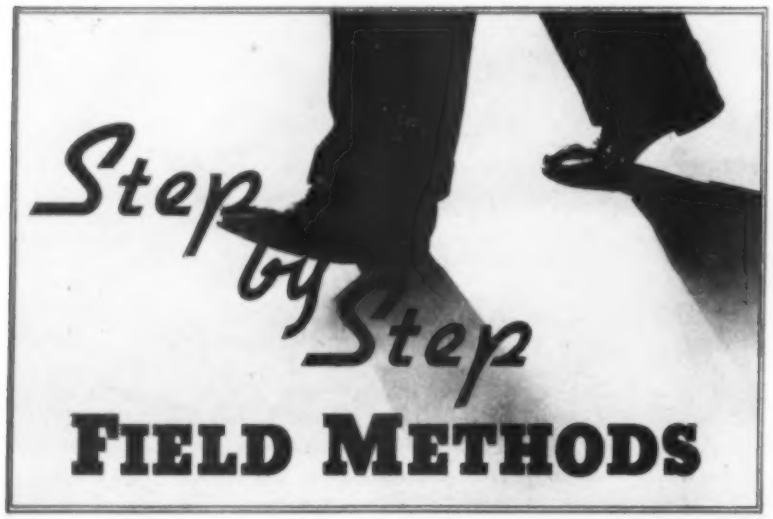
TO BATCH concrete mixer with sand and stone, R. C. Wieboldt Co., Chicago, uses International tractor with Trackson shovel attachment.



SWINGING LEADS hung from 65-ft. aluminum boom of Koehring crane guide McKiernan-Terry 7B hammer driving temporary falsework piles for erection of 270-ft. steel truss span crossing Mahoning River at Edinburg, Pa., erected as part of $370,000 bridge, grade separation and road relocation contract of Holmes Construction Co., Wooster, Ohio, (D. D. Mullett, superintendent), for Pennsylvania Department of Highways.



ARCHED COVER of 16-gage galvanized corrugated Armco sheets protects stored timber of Houston Coal Co., Scranton, Pa. Roof 30 ft. long, with span of 12½ ft. and rise of 6½ ft. in arch, rests on eight 4-in. pipe uprights notched to take 20-lb. scraprail spandrel beam. Corrugated sheets are bolted to 3x3-in. angle which is bolted to rail. Drip flange at edge of roof is formed of bent galvanized sheet.



Railway Sub-Ballast Slabs

Of Pre-Cast Concrete

Eliminate Track Maintenance on Gumbo Fill

SUCCESS of a test section of reinforced concrete sub-ballast slabs in stabilizing track and eliminating water pockets has led engineers of the Missouri Pacific Railroad to install another 2,025 lin.ft. The first 2,600 lin.ft. of slabs were placed in November, 1936, and maintenance on this half-mile stretch was only $50 to $60 in the succeeding 16 months, although tamping of ballast

1 **EXTRA GANG** of 26 men removed ballast to depth of 10 to 18 in. below base of rail, then blocked track to facilitate installation of slabs.

3 **CAR JACKS** were used to raise rails, with ties still attached, until track could be blocked up.

2 **SLABS WERE LIFTED** to place from right-of-way by a 25-ton locomotive crane.

4 **SLIDING INTO PLACE** of slabs was done by swinging crane boom. Hitch on slab is eccentric by 6 in. so that rear end drags while the forward end is off ground. When cable, hooked to slab through lifting loops, had fouled track rail, it was unhooked and again attached to the lifting loops between rails. Note that ties have been bunched to permit free access to lifting loops, and to provide room for bridle cables.

under ties to keep the track in alignment and to grade was nearly a continuous performance, and additional ballast had to be supplied at frequent intervals before the slabs were put in. Both sections were installed near Jones Ridge, Ill., along a heavy traffic freight line of the Missouri Pacific built on a fill in Mississippi River bottom land comprising mostly gumbo and clay. An economical cure for such soft subgrade has long been sought which led to the initial experiments with concrete sub-ballast slabs.

Witnessing the recent completion of the installation of this second section of sub-ballast slab were 19 chief, maintenance, and division engineers of 13 railroads. And they stood in a driving rain to inspect the construction procedure and to examine slabs comprising the experimental section that have for a year and one-half held the track to line and grade under the heavy freight traffic over the road.

Sub-ballast slabs were developed to spread the load on the track over a greater portion of the roadbed. Reinforcement and slab thickness provide a resisting moment approximately equal to that of first class wooden ties. By applying ballast and ties above the slab, the load distributing ability is increased and the transverse strength of the ties is added to that of the slab, producing more than double the transverse strength of track on ballast alone. Also, the slab "blankets" the subgrade, preventing loss of ballast into the subgrade or any pumping action of the ties and conducting water away from the track center.

Slabs are 12 ft. wide (over the width of the track) and 9 ft. long. The center thickness of 6½ in. is tapered to 5½ in. at the slab edges to permit water to drain away from the track center. Slabs are reinforced with ½-in. round bars; longitudinally they are spaced on 12-in. centers; and transversely on 6-in. centers at the bottom of the slab and on 12-in. centers at the top.

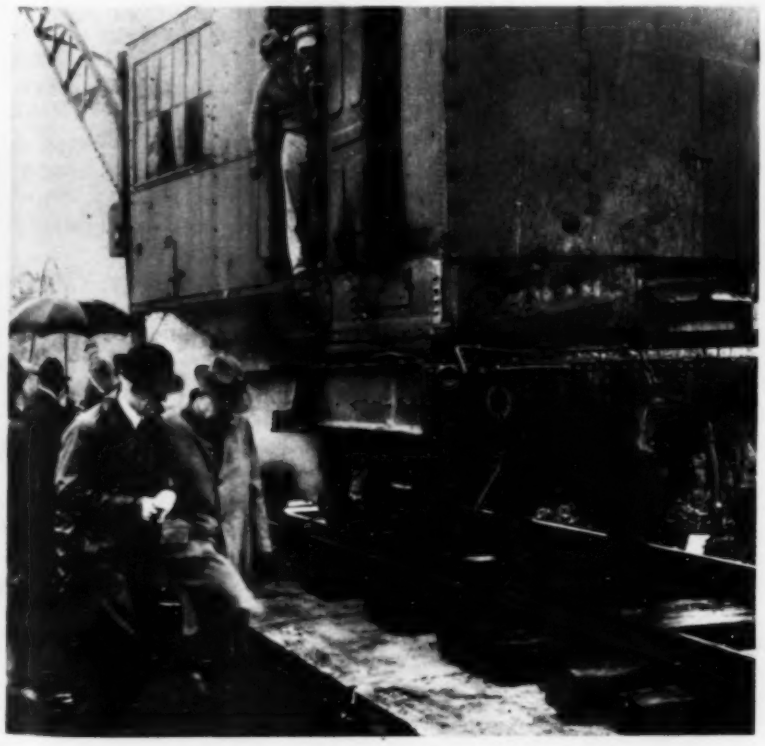
All slabs were cast by the Missouri Pacific at Little Rock, Ark. They were cast in gang molds, and the concrete, of approximately a 1:2:3½ mix with a water-cement ratio of 6 gal. per sack, was vibrated. Slabs were then cured under wet burlap and stacked in the yard until needed on the job. They were provided with cast-in steel lifting loops set 6 in. off slab centerline to let the forward end clear the subgrade and the rear end drag, facilitating slab placement.

Excluding the cost of transporting the slabs from the casting yard to the right-of-way where required, installation of slabs on the 1936 project cost $4.14 per track-foot. At that time, 80 slabs (800 ft. of track) were set in a 5½-hr. working day; on the project recently completed, workmen placed as high as 101 slabs (909 track-ft.) in a day of 3 hr. 50 min. of actual work. The highest speed attained for any considerable period was 51 slabs (459 track-ft.) in 1 hr. 45 min. This included all operations — cribbing out between ties, digging down to predetermined subgrade, jacking and blocking the track, bunching the ties, and setting the slabs.

The cost of the second installation compares favorably with the first, although increases in cost of labor and materials raised the slab manufacturing cost slightly. On the other hand, the extra gang of 36 men on the first project was reduced to 26 on the more recent project.

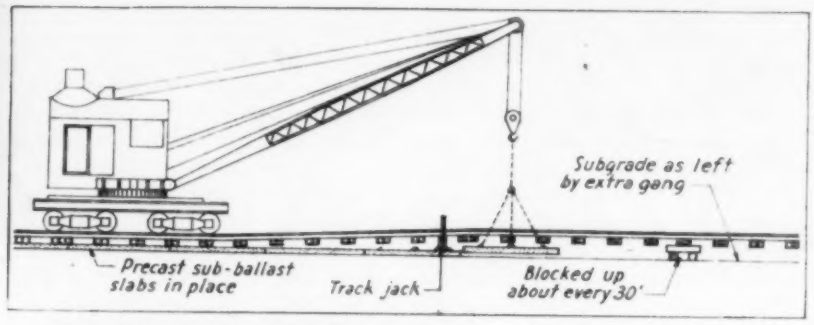
Work on both installations was directed by A. A. Miller, engineer, maintenance of way, Missouri Pacific Railroad. F. E. Bates, bridge engineer, designed the slabs, which were manufactured under the supervision of J. R. Showalter, assistant engineer. P. P. Wagner, division engineer, directed slab installation.

5 **WHILE SLAB** was being moved into position, track was supported by car jacks resting on adjacent slab just set and on blocks about one rail length ahead.



6 **AS CRANE MOVED AHEAD** over newly placed slabs, the ends of ties were blocked up on 1-in. strips to compensate for the slope in the upper faces of the slabs. The two men in foreground are J. S. McBRIDE (left), chief engineer, Chicago & Eastern Illinois Ry., and V. R. WALLING, engineer, maintenance of way, Chicago & Western Indiana R.R.

7 **SLABS SUPPORTED TRACK** until it had been ballasted with chats ballast shown, in background.

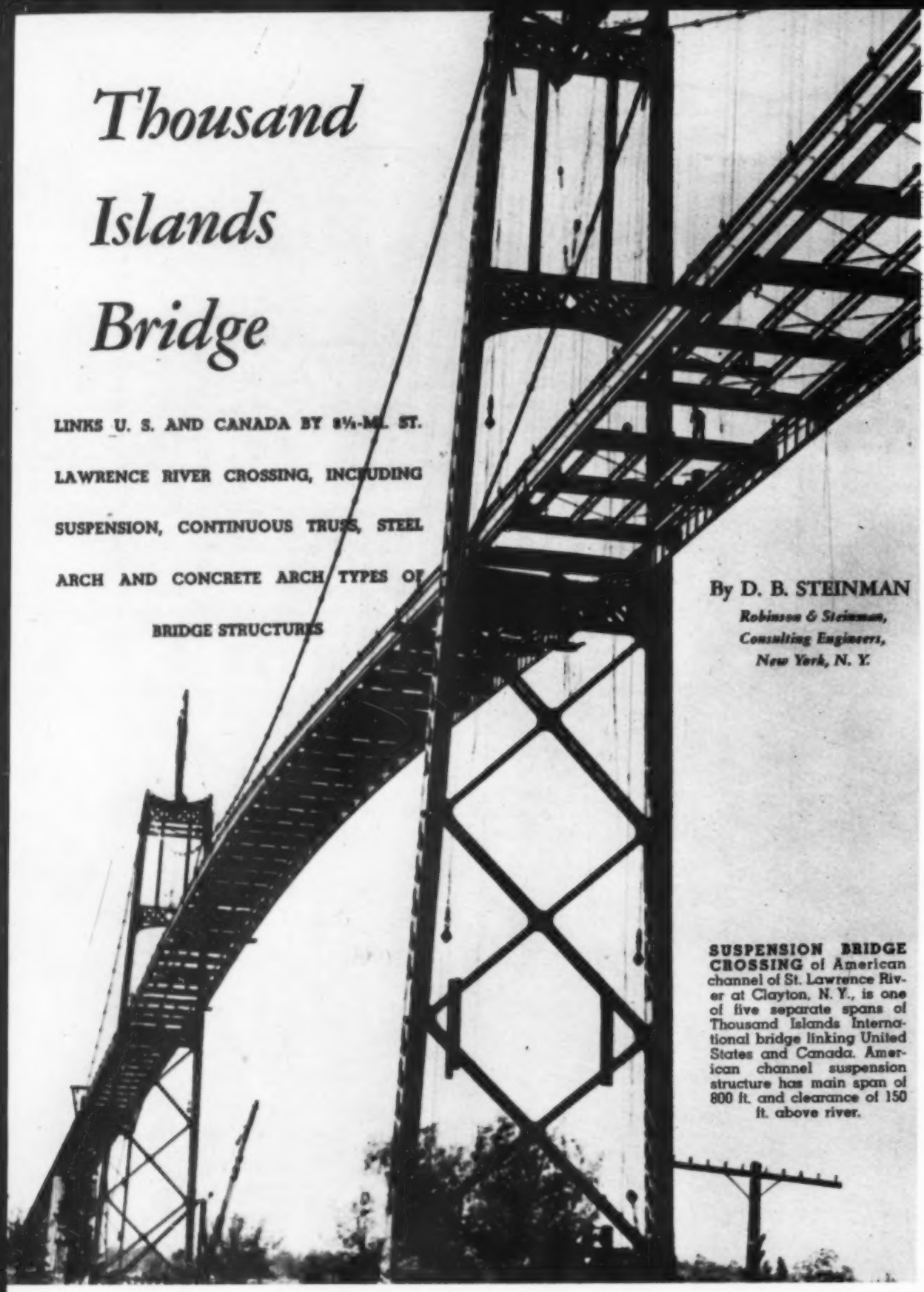


8 **DIAGRAMMATIC SKETCH** of method of placing reinforced concrete sub-ballast track slabs with aid of locomotive crane and jacks.

Thousand Islands Bridge

LINKS U. S. AND CANADA BY 8½-MI. ST. LAWRENCE RIVER CROSSING, INCLUDING SUSPENSION, CONTINUOUS TRUSS, STEEL ARCH AND CONCRETE ARCH TYPES OF BRIDGE STRUCTURES

By D. B. STEINMAN
Robinson & Steinman, Consulting Engineers, New York, N. Y.



SUSPENSION BRIDGE CROSSING of American channel of St. Lawrence River at Clayton, N. Y., is one of five separate spans of Thousand Islands International bridge linking United States and Canada. American channel suspension structure has main span of 800 ft. and clearance of 150 ft. above river.

THOUSAND ISLANDS INTERNATIONAL bridge, under construction since May 1, 1937, and to be officially opened Aug. 18, will join the United States and Canada across the St. Lawrence River. It extends from Collins Landing, N. Y., (near Alexandria Bay) to Ivy Lea (near Gananoque) in Ontario. This crossing, 8½ mi. long, utilizes the islands to reduce the span lengths required, so that the total cost of construction is only $2,200,000. The crossing over the American channel, from the mainland to Wells Island, consists of a suspension bridge of 800-ft. main span, with an underclearance of 150 ft. above the river. The Canadian crossing includes: a continuous truss of two 300-ft. spans (from Hill Island to Constance Island); a steel arch of 348-ft. span (from Constance Island to Georgina Island); and a suspension bridge of 750-ft. main span and 120-ft. underclearance from Georgina Island to the Ontario mainland. The boundary at the International Rift, between Wells Island and Hill Island, is bridged by a 90-ft. rigid frame arched span of reinforced concrete with masonry facing.

Selection of Design

The entire crossing makes an interesting object lesson to the student of bridge engineering. A view of the natural topography and of the exposed rock formations makes the choice of bridge type for each crossing almost obvious. Natural rock abutments rising steeply from the water's edge dictated the steel arch span, and the availability of a small rock island at mid-channel dictated the two-span continuous truss. The discovery of an uncharted shoal of solid rock, surrounded by deep water, 240 ft. offshore of Georgina Island, made a 750-ft. suspension span economically feasible over the Canadian channel and determined the location and arrangement of the series of spans, piers, and anchorages.

As Thousand Islands bridge traverses a region of unusual scenic beauty, it was desired to afford the motoring public a clear and unobstructed view of the colorful panorama from the bridge roadway. This required the use of deck structures in order to minimize obstruction of view by truss members and bracing. High underclearance requirements (150 ft. for the American crossing and 120 ft. for the Canadian crossing) precluded the use of deck truss bridges of the cantilever or other types. This combination of conditions was best satisfied by the adoption of suspension bridges for the principal spans, with shallow plate girders (only 6 ft. deep) for stiffening. The presence of rock at or near ground surface for inexpensive anchorages further helped to establish the clear economic superiority of the suspension type. In addition, the suspension designs offered maximum grace and beauty to do justice to the scenic setting.

For harmony, deck girder spans were adopted for the approaches. For maximum economy and rigidity, and to keep the girder depth shallow, each viaduct was made a series of three-span continuous girders.

In the series of bridges and viaducts constituting the Canadian crossing Lost Channel, between Constance and Georgina Islands, is spanned by a steel arch of 348-ft. span. This is immediately south of the Canadian suspension bridge, and the roadway elevation is high enough to permit a deck structure to be used. A simple truss span was first considered, but was changed to a steel arch in consideration of the beauty of the site and the presence of natural rock abutments.

Further south in the Canadian crossing is the bridge between Constance and Hill Islands. This is separated from the suspension bridge and the steel arch by the length of plate-girder viaduct traversing Constance Island. The roadway level at this point is too low and the channel is too wide to permit a deck structure. The availability of a small rock island at mid-channel for a center pier indicated the most economical solution as a continuous through-truss of two 300-ft. spans.

Main Piers

The south main pier of the Canadian suspension bridge is founded on an isolated shoal of solid rock surrounded by deep water. The discovery of this shoal during the pre-

CONTINUOUS THROUGH TRUSS of two 3,000-ft. spans crosses Lost Channel from Hill Island to Constance Island, Ontario. This structure is connected with suspension span by a length of plate girder viaduct.

liminary studies made available a pier foundation only 17 ft. deep, located 240 ft. off-shore. This made it possible to use a suspension bridge of only 750-ft. main span instead of the much longer and more expensive span that would otherwise have been required. It also made it possible to bring the cable down to economical anchorage within the narrow limits of Georgina Island.

All other main piers throughout the crossing, from mainland to mainland, are founded on shallow or exposed bedrock. This favorable condition of topography reduced the cost of the substructure to a minimum. In fact, on this project, the cost ratio of substructure to superstructure is only 1:5, thereby proving an exception to the usual rule that an economical layout is indicated by equal costs of substructure and superstructure. For the shallow piers, the governing design condition was that of wind on the tower and traveler during tower erection.

Anchorages

The south end of the Canadian suspension bridge lands on the north shore of Georgina Island, and the narrow width of this island is such as to locate the anchorage on the south shore. Here the formation of the rock rising steeply from the water's edge is ideal for resistance to horizontal cable pull. It is also ideal for resistance to the horizontal thrust of an arch. Advantage was taken of this fortunate combination of natural conditions to locate at this point a triple-function pier which is unique in design. It serves (1) as the south anchorage of the suspension bridge; (2) as the north abutment of the steel arch; and (3) as the pylon that flanks the north end of the arch to support the arch floor panel and the connecting viaduct span. The favorable conditions of rock foundation for this anchorage permitted a ratio of about 1:1 between net vertical weight and maximum horizontal reaction from arch and cables combined, instead of the usual ratio of 2:1 or 3:1.

For the south anchorage of the American suspension bridge, on the mainland, rock was found to be 30 to 50 ft. below the surface. The earth was excavated to a depth of 15 ft., and steel piles (14-in., 89-lb. H-beams) were driven over the area of the base. Of these, 68 piles were battered 4:12 to resist the cable pull, and 64 piles were vertical. The rear end of this anchorage carries a high concrete pier, carrying viaduct spans. The net vertical weight of this anchorage is about 2.2 times the maximum horizontal component of cable pull. For dead load pull of the cables, this ratio is about 3.

The north anchorages of both suspension bridges are in solid rock close to the ground surface. This favorable condition reduced the size and cost of these anchorages to a minimum.

Viaduct Piers

To carry the viaduct, which is made up of sets of three-span continuous girders, every third pier is of high concrete construction in order to take the longitudinal reaction and to provide room for expansion rockers. The intermediate piers are flexible steel columns.

For the viaduct piers founded on rock anchor bolts were run through each pier base and 5 ft. into the rock in order to take care of the temporary uplift reactions producible by wind acting on the structure before the concrete deck is placed. There are no uplift reactions for the finished structure.

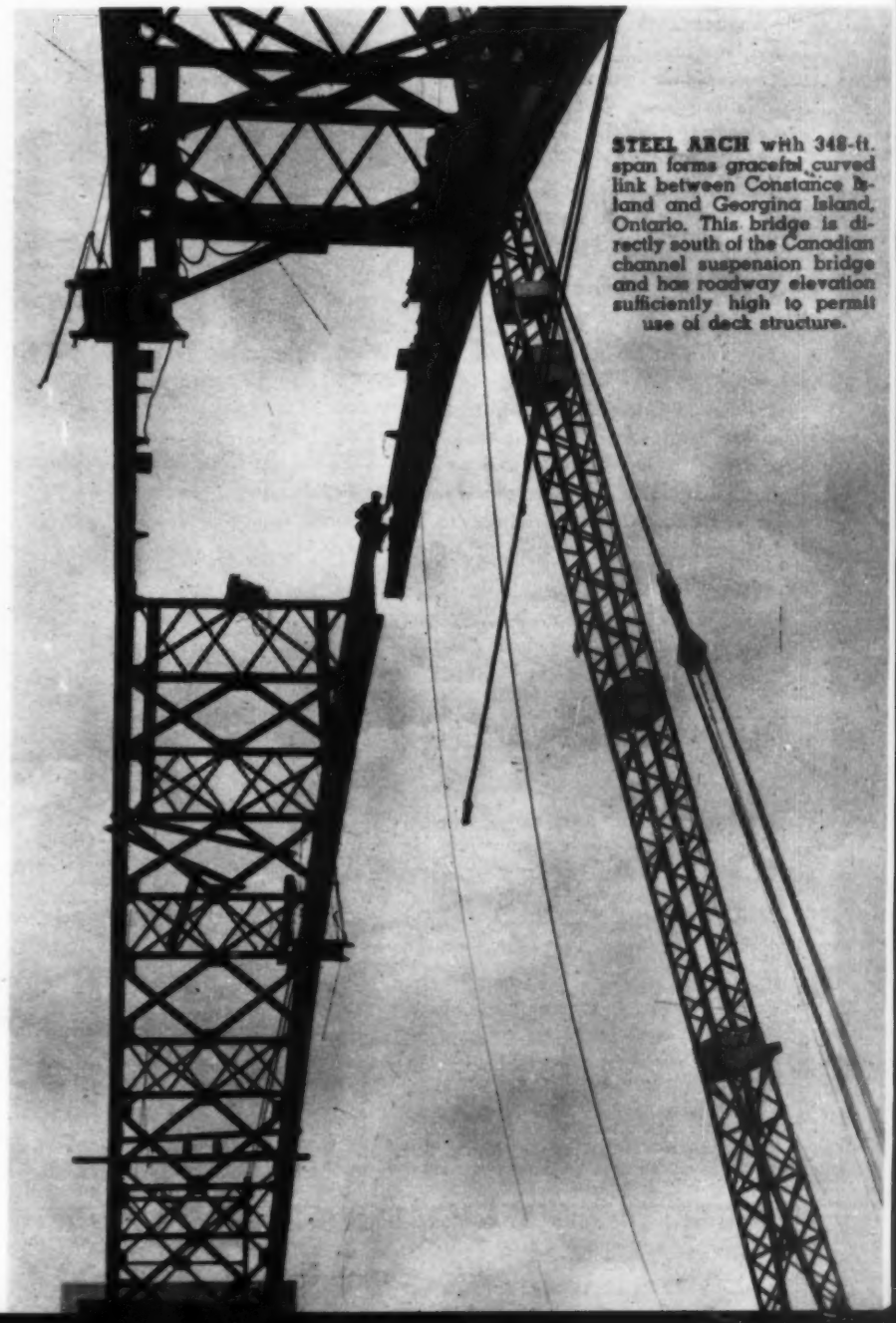
Some of the viaduct piers are founded on earth. For these, the maximum base pressures were kept under 1½ tons per square foot.

Novel Strand Anchorage

The suspension span cables are of pre-stressed rope strand construction, each cable consisting of thirty-seven 1¼-in. strands. A new and improved type of cable anchorage for rope strands, invented by Dr. Holton D. Robinson of Robinson & Steinman, has its first application in the two suspension bridges of this crossing. It is believed to be the simplest and most economical form of anchorage thus far devised for multiple rope-strand cables. Each of the rope strands composing the cable is separately and adjustably connected to a round steel bar projecting from the anchorage concrete. Corresponding to the thirty-seven 1¼-in. strands composing the cable, there are thirty-seven 2⅜-in.-diameter steel bars independently embedded in the concrete. These are set in hexagonal configuration to match the strand arrangement, and the bars converge as they project from the anchorage to meet the diverging strands. The upper end of each bar is upset and threaded.

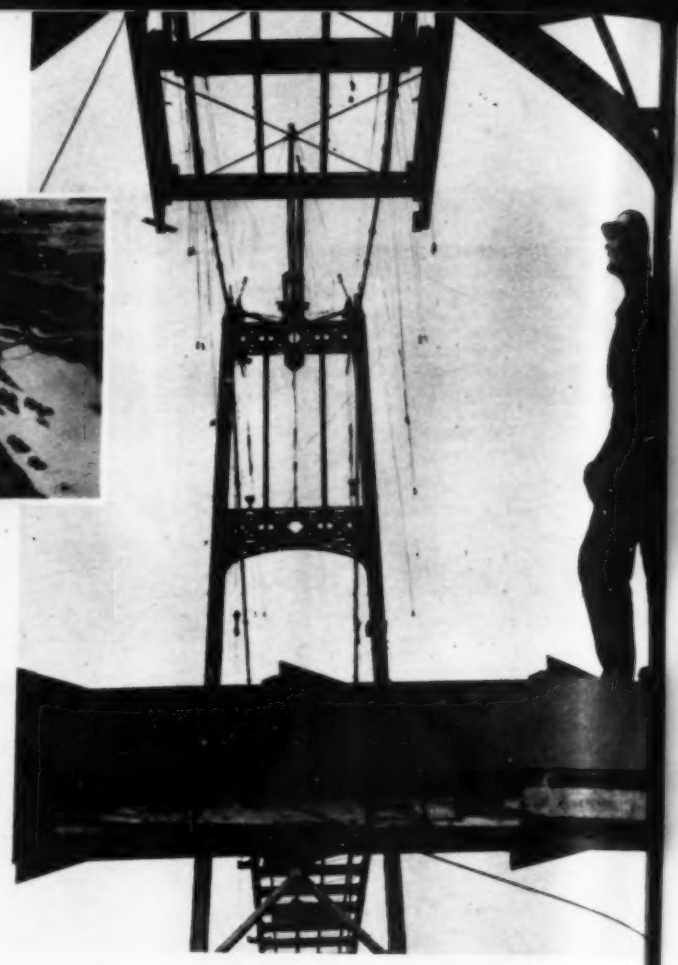
Each strand terminates in a cast steel socket which is externally threaded, opposite hand. Connection and adjustment between strand socket and anchor bar are made by an internally threaded sleeve which is turned by wrench to draw the two together. In actual application, this arrangement worked easily and smoothly and proved most satisfactory. After adjustment for any length variations, to assure uniform strand tension, the connecting sleeves are spot-welded at the ends to prevent any possibility of subsequent rotation.

The bridge carries a two-lane road-



STEEL ARCH with 348-ft. span forms graceful curved link between Constance Island and Georgina Island, Ontario. This bridge is directly south of the Canadian channel suspension bridge and has roadway elevation sufficiently high to permit use of deck structure.

FIVE SEPARATE BRIDGES, with 8½ mi. of approaches and connecting roadways, constitute Thousand Islands international crossing of St. Lawrence River between Collins Landing, N. Y., and Ivy Lea, Ontario. Structures, from left to right, are: American Channel suspension bridge, with 800-ft. main span; 90-ft. concrete rigid frame arch span across International Rift; continuous truss of two 300-ft. spans between Hill and Constance Islands, Ontario; 348-ft. steel arch from Constance to Georgina Islands, Ontario; and suspension bridge with 750-ft. main span over Canadian channel.



STEEL ERECTION (right) proceeds on 750-ft. suspension span of Canadian channel crossing under supervision of "Red" MacGillivary, wearing "hard-boiled" hat as safety measure.

way, 22 ft. wide, and two sidewalks. On the suspension spans, the roadway and sidewalks are contained between the stiffening girders which also serve as railings. Their low height permits motorists to enjoy a clear view of the surrounding scenery. The usual layout of floorbeams and stringers is used. The armored concrete roadway is 4¼-in. I-Beam-Lok.

On the viaduct spans it was found most economical to use floorbeams spaced about 6½ ft., decked on and cantilevered beyond the girders. This arrangement saves steel and facilitates erection; it is also convenient for simple and substantial connection of railing posts. On these spans the roadway is the conventional 8-in. reinforced concrete slab.

The only international span in the entire project is the small bridge over the "Rift" between Wells Island (U.S.A.) and Hill Island (Canada). With a span length of only 90 ft., this structure has been nicknamed "the biggest little bridge in the world." A brass strip traversing the roadway and bronze tablets mounted on the railings mark the international boundary. (One of the official boundary monuments is preserved and referenced under the bridge abutment.) A reinforced concrete span of rigid frame type, with arch outline, was adopted as economical and appropriate for this structure. This is faced with granite cut from the native rock at the site, so that the arching span uniting the two countries is virtually built of the material from which it springs.

Organization and Construction

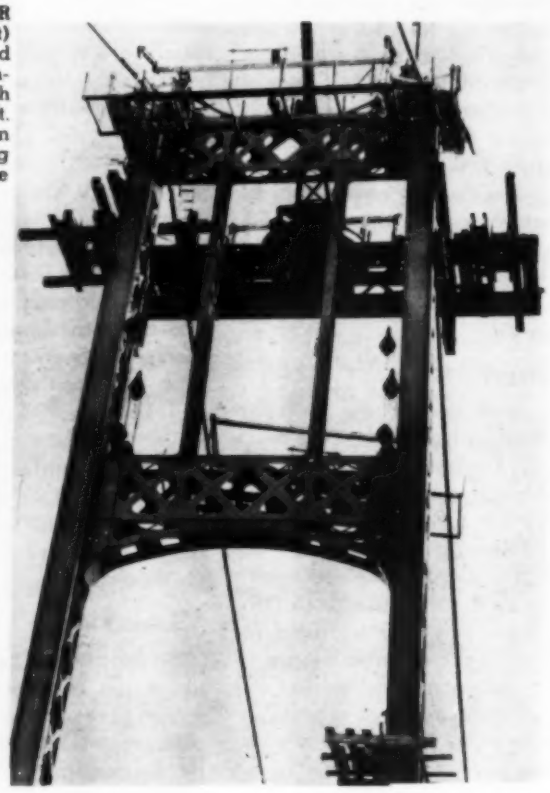
The bridge is being built under the auspices of Thousand Islands Bridge Authority, set up by Act of the Legislature of New York State. The members of this Authority are Elton H. Miller, chairman, Leon Schwerzmann, secretary, Frank J. Martin, Eben C. Sawyer, and Ross Parker, all of Jefferson County, New York. W. Grant Mitchell is executive secretary. To this public authority was transferred the Canadian franchise of a private corporation which had previously been formed in Canada to build the Canadian crossing. The bridge is financed by revenue bonds to be repaid from tolls, and is to become a free public crossing as soon as the bonds are amortized.

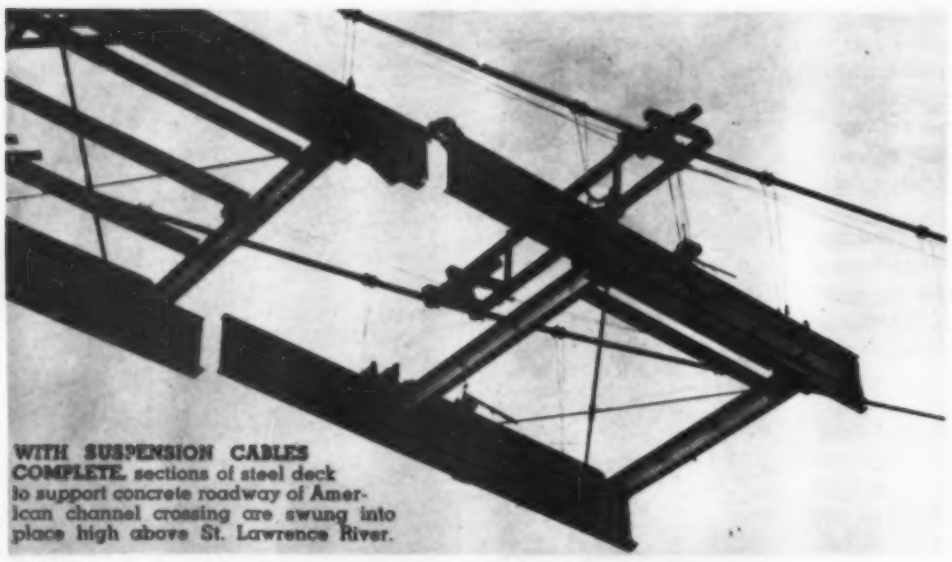
The entire project was designed by Robinson & Steinman, who were engaged as consulting engineers in charge of design and construction. Monsarrat & Pratley, of Montreal, were retained as associate engineers. Wm. T. Field, of Watertown, N. Y., is advisory engineer. For Robinson & Steinman, J. London is in charge of the office force on design and R. Boblow is in charge of the resident engineer corps on construction.

The project is divided into five principal contracts, on which the contractors are as follows: Dominion Construction Co., for the American substructure; American Bridge Co. for the American superstructure; Cameron & Phin for the Canadian substructure; Canadian Bridge Co. for the Canadian superstructure; and R. A. Blyth for the International Rift span.

Construction was begun May 1, 1937. The contract date for completion is Nov. 1, 1938, but actual completion is now ahead of schedule, and the opening date has been set for Aug. 18, 1938. The last border troubles occurred in 1838, and the opening ceremonies for Thousand Islands bridge are planned to feature the celebration of 100 years of international peace and good will between the two nations now united by this new link of friendly intercourse.

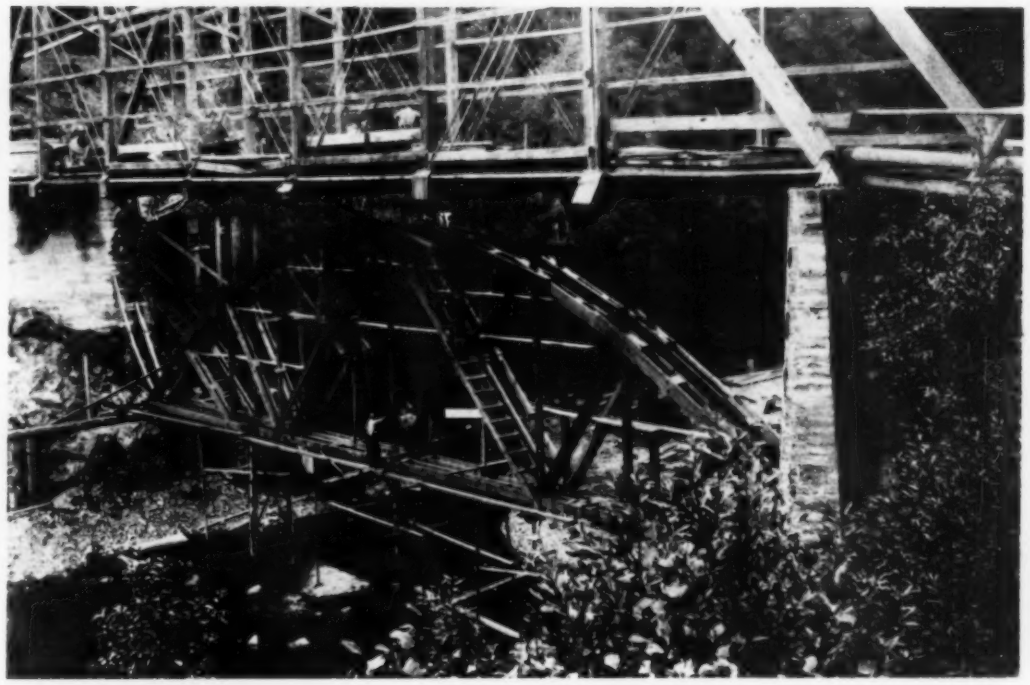
STEEL TOWER ERECTION (right) nearly completed for 750-ft. suspension span with clearance of 120 ft. above Canadian channel crossing of St. Lawrence River.





WITH SUSPENSION CABLES COMPLETE, sections of steel deck to support concrete roadway of American channel crossing are swung into place high above St. Lawrence River.

BOWSTRING TRUSS, *Bolstered With Timber Connectors, Provides Bridge Arch Centering Without Midstream Support*



ERECTION OF BOWSTRING TRUSS (above and below) to serve without mid-stream support as centering for concrete bridge was accomplished with use of timber connectors. Span of arch centering is 110 ft. and rise 23 ft.

A SIMPLE BOWSTRING TRUSS reinforced with timber connectors recently played the unconventional role of arch centering for a concrete bridge when engineers of California's Division of Highways, building a Butler Valley road bridge, found that the Mad River in Humboldt County was too swift to permit ordinary mid-stream support. It was not considered advisable to build the centering up from the bed of the stream as is frequently done in normally low-flow California rivers; instead it was decided to erect it from abutments on each bank of the stream. Erection of connector-built timber trusses, designed to conform closely to the intrados of the concrete arch, was believed to be the best solution to the problem, not only because of its structural efficiency, but also because it left the stream flow relatively unobstructed and support for the concrete was believed to be more secure.

The concrete arch reached a span of 130 ft., but due to the contour of the ground the trusses used for arch centering were designed with a span of but 110 ft. and a rise of 23 ft. The top of the upper chord of the wood trusses was placed slightly below the intrados of the concrete arch rib to allow room for the concrete forms.

Total loading for which the two trusses combined were designed was 105 tons, or 52.5 tons per truss. The equivalent loading for similar roof trusses spaced 15 ft. c. to c. would be slightly over 50 lb. per square foot. It was assumed loading (placing of concrete) would be at panel points and would simultaneously progress from each end. However, an unbalanced load equal to two panel lengths of concrete was allowed for in designing the web system. Actual load on the trusses was estimated at 85 tons, while the measured deflection of the trusses under load was but 7/8 in.

The trusses consisted of two 4x14-in. upper chords; two 3x10-in. lower chords with web members 4x8 in. In order to eliminate the necessity for elaborate steel heel plates, thus reducing the cost, the type of design employed for these trusses called for the use of an auxiliary lower chord stub at the heel. The truss was so planned that the two lower chord members are outside of the upper chord members which, in turn, are separated by an auxiliary lower chord stub extending back far enough to allow for a bolt and split-ring connection (with filler plates) to the two main members of the lower chord. This device permits the transfer of stress between upper and lower chord members through four contact surfaces instead of two, and thus affords twice as much safe load capacity in the heel joint as is possible with an ordinary filler block between the two upper chord members.

Each truss required slightly less than 4,000 ft. B.M. of lumber and the actual cost of the two trusses completely assembled and erected was $1,100, or about $140 per M ft. of lumber. This is claimed to be typical of connector-built construction in which the cost per M ft. of lumber runs higher than with lower grade material in bolted assemblies, although the total truss costs run lower than for ordinary construction of equal load-carrying capacity.

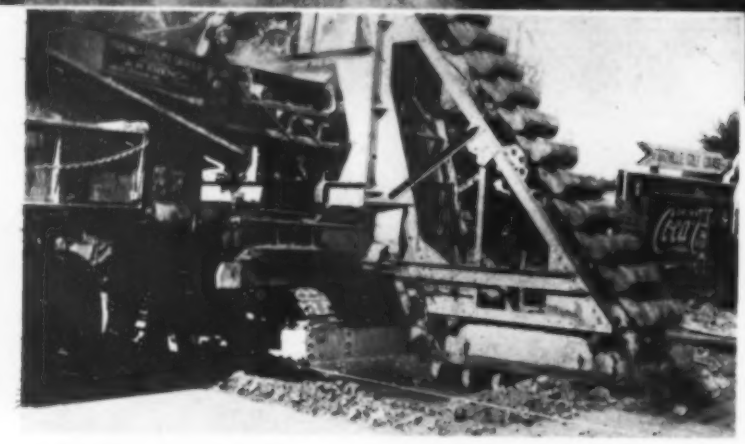
The roof truss design was prepared by the Timber Engineering Co., of California, licensee of the Timber Engineering Co., of Washington, D. C. This type design for bridge construction would not have been possible without employing Teco connectors. The contractor was the Mercer-Fraser Co., of Eureka, California, which fabricated and erected the trusses at the bridge site.

One Set of Equipment Builds Three Widths of Concrete Pavement

By FRED C. TODD

Paving Superintendent *New Castle, Ind.*

UTILITY GRADER trims subgrade for bituminous macadam parking strip and curb and gutter on side of new slab in town.



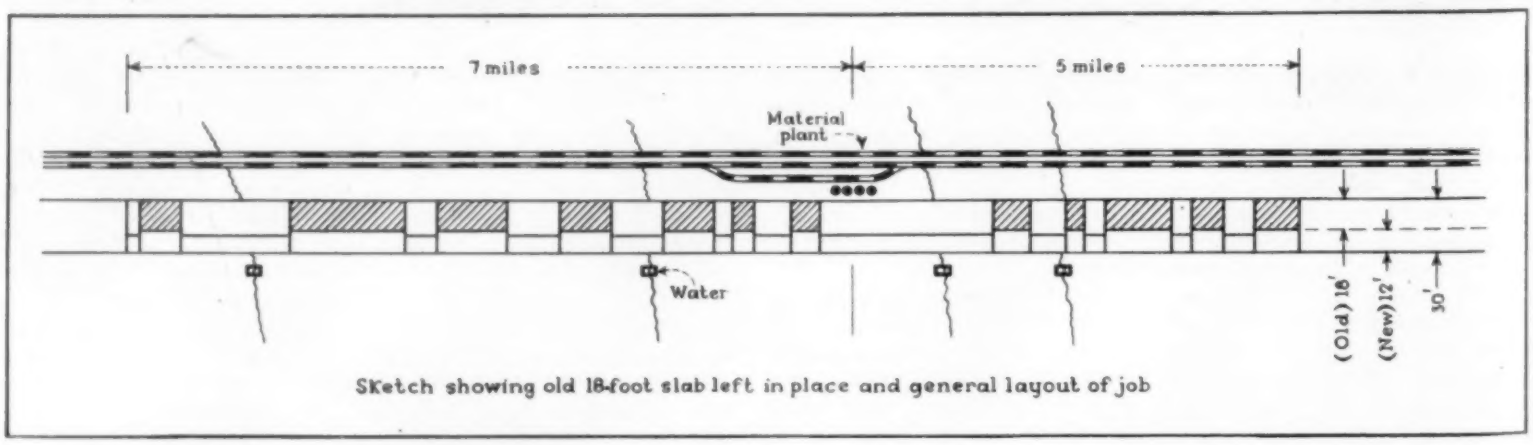
MULCH BOARD back of buckets drags excess fine dirt along, leaving top grade that is easy to finish.

MATERIALS HANDLING PLANT comprises series of bins stretched out for distance of 1,000 ft. on railroad siding parallel with highway.

ON TWO CONTRACTS adjoining and totaling 12 mi., the Indiana State Highway Commission salvaged approximately 5 mi. of old 18-ft. concrete slab located at various points as shown on the accompanying sketch. The 30,000 sq.yd. salvaged, along with 145,000 sq.yd. of new pavement, gave a first-class pavement throughout of 30-ft. width but presented quite a problem for the Andrews Asphalt Paving Co., Hamilton, Ohio, contractor, in arranging operations to take care of variations of width.

Three Widths—Where the old 18-ft. slab was retained, a 12-ft. slab was poured adjoining, thus giving the 30-ft. width. Where the old slab was removed, a new 30-ft. slab was placed, this concrete being poured in two widths of 10 and 20 ft. Thus the contractor was confronted with the problem of providing three widths of equipment, namely, 10, 12, and 20 ft. It was at once found impracticable to go through the entire 12 mi. with one width at a time as the grading could not be completed that fast and a full 12 mi. of water line would have to be laid.

Water Supply—Water locations proved the determining factor in deciding that the job be worked in sections of 4 mi. at a time. Two pumps were used, a C. H. & E. and a Barnes, as water had to be maintained in part of one 4-mi. section for curing after that section had been completed and another started. With one exception,



SKetch showing old 18-foot slab left in place and general layout of job

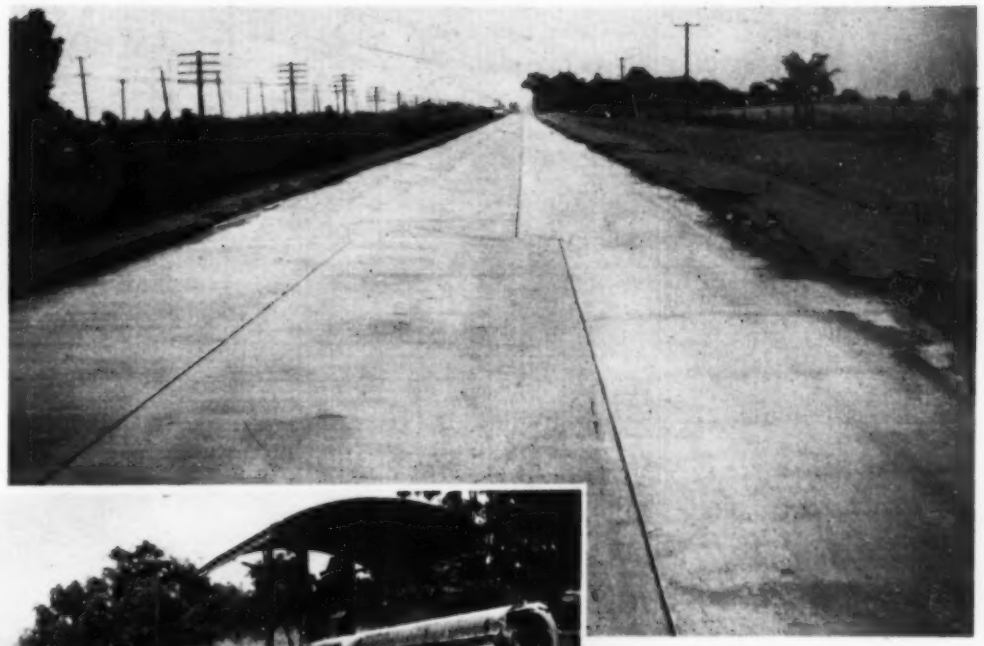
EXISTING SLAB 18 ft. wide is left undisturbed at twelve irregular locations totaling about 5 mi. in overall paving length of 12 mi. Four sources of water determine contractor's choice to build project in three 4-mi. sections.

4 mi. of pipe proved to be sufficient as the paving of each portion was directed toward the adjoining new section. This procedure meant that only about half of the pipe for a completed section had to be retained for curing purposes, releasing half of it to start the new 4-mi. section.

Grading Equipment—Fine grading was carried on by two methods. For part of the job there was available a new French utility grader, while on the remainder final grading was accomplished by a Galion motor grader. After grading by either of the two methods, forms were set, Heltzel forms being used on one side and Blaw-Knox on the other, and the final exact grade was obtained by pulling a Cleveland form grader with a Huber roller and then checking with a Heltzel scratch templet.

Materials Handling—Material was handled at a central plant described in detail in *Construction Methods and Equipment*, Feb., 1937, pp. 46-47.

This plant consisted briefly of a Blaw-Knox bulk cement plant unloading from hopper cars and three aggregate bins fed by made-up belt and bucket conveyors consisting of Link-Belt buckets and drive mechanisms using Cincinnati Rubber Co. belting, the batch bins being made by the Blaw-Knox Co. Materials were batched into Blaw-Knox cement boxes and the bodies of Ford V-8 and Chevrolet trucks, each truck carrying two batches of about 4,400 lb. direct to the skip of a Foote 27E paver.



VARIABLE PAVING WIDTHS (right) for 30-ft. roadway comprise 20- and 10-ft. slabs, in foreground, and 12-ft. lane alongside existing 18-ft. slab, in background.

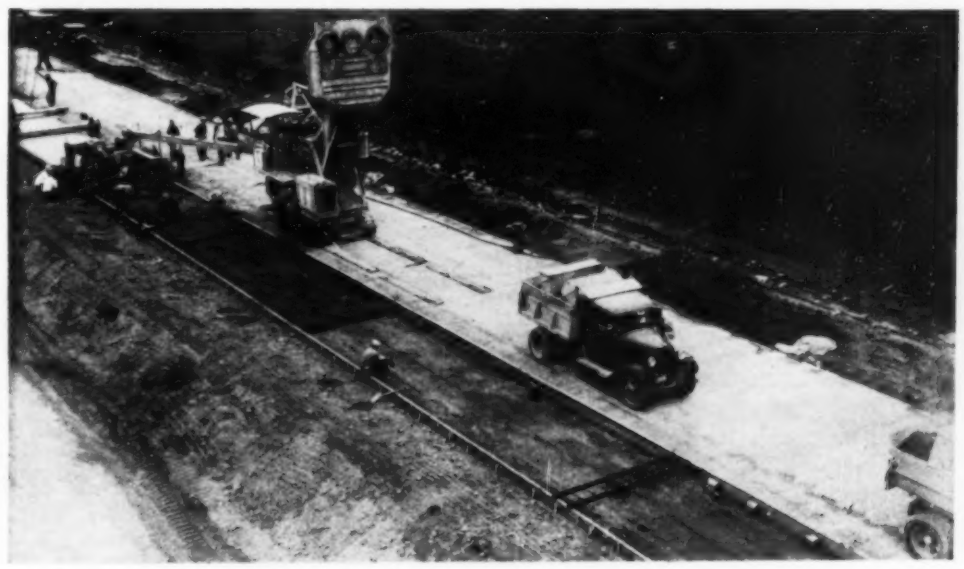
PLANER pulled by roller finishes subgrade for slab.

PAVER DEPOSITS lower-course concrete ahead of strike-off riding on forms.

Paving Operations — As all slabs were reinforced with American Steel & Wire Co. sheets of wire-mesh reinforcing, the concrete had to be deposited and struck off 2 in. below finish for the placing of the mesh. The strike-off was accomplished by using a heavy wooden built-up templet that rode on the forms and was pulled by whatever equipment was available, part of the time by the mixer itself and the rest of the time by an Allis-Chalmers tractor. While the mesh course was being struck off and pulled, there was no delay in operations, as the top course at the same time was being poured and then struck off and belted by a Blaw-Knox gas-electric finishing machine.

Plans called for Translode expansion joints with preformed bituminous filler. Expansion joints were at 80-ft. intervals, and between each pair there was placed a built-up contraction joint which was held in place with a dowel rod spotter made by the Flexible Road Joint Machine Co. Between adjoining slabs a butt joint was constructed along the thickened edges by placing Carey heavy roofing paper of $\frac{1}{8}$-in. thickness. For the longitudinal joint on 20-ft. slabs and tops of the contraction joints, $\frac{3}{8}$ x 2-in. preformed Carey asphalt strips were used, these being placed in grooves cut by the Flexible Road Joint powered joint machine.

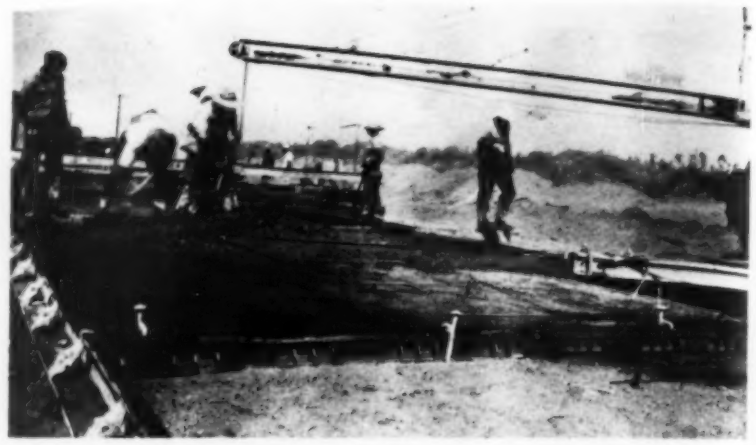
After the top course had been screeded and belted with the Blaw-Knox gas-electric finisher the surface was checked for longitudinal depression by going over it with a longitudinal float. The screeding action of the bull float then was carefully checked by finishers with long-handled steel straight-edges, and a final belting was given. A broom finish was given the slab by carefully drag-



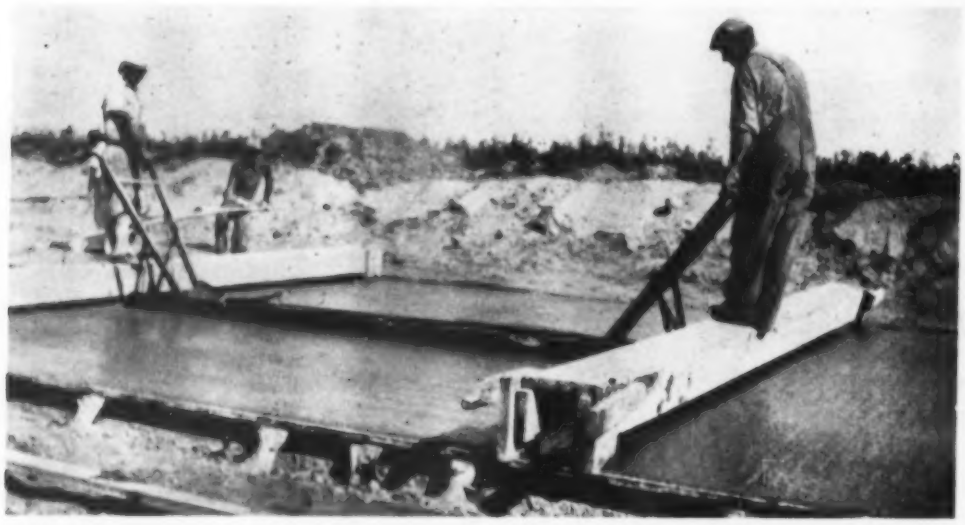
TRAVELING ON COMPLETED SLAB (right) protected against traction treads and skip by planks and old tire-casings, paving mixer places adjacent 10-ft. lane. Steel angle on edge of slab carries one wheel and screed of finishing machine. Rolls of heavy roofing paper in right foreground are used in butt joint between two slabs.

Principal Quantities and Unit Prices For Two Projects Combined

	Quantity	*Unit Price*
Reinforced concrete paving	145,764 sq. yd.	$1.65
Expansion joint, Type "A"	10,398 lin. ft.	.72
Expansion joint, Type "D"	5,616 lin. ft.	.65
Contraction joint	15,457 lin. ft.	.18
Pavement removal	51,770 sq. yd.	.15
Excavation, common	74,112 cu. yd.	.28
Excavation, special borrow	22,723 cu. yd.	.35
Finishing shoulders and ditches	57,427 lin. ft.	.12
Total contract price for two projects		$357,167



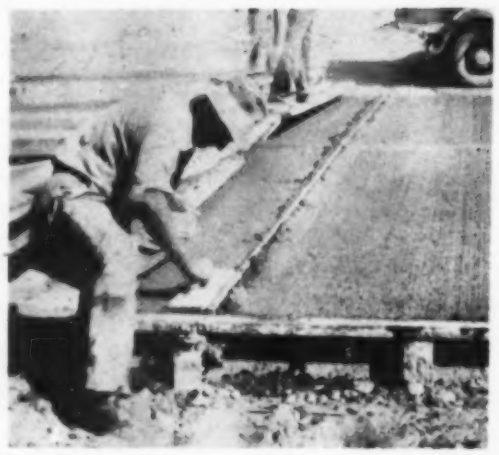
HOOKED STAKES hold expansion joints in place. Greased channel cap shields over joint filler later are removed to give depressed joint.



LONGITUDINAL BULL FLOAT irons out longitudinal irregularities.

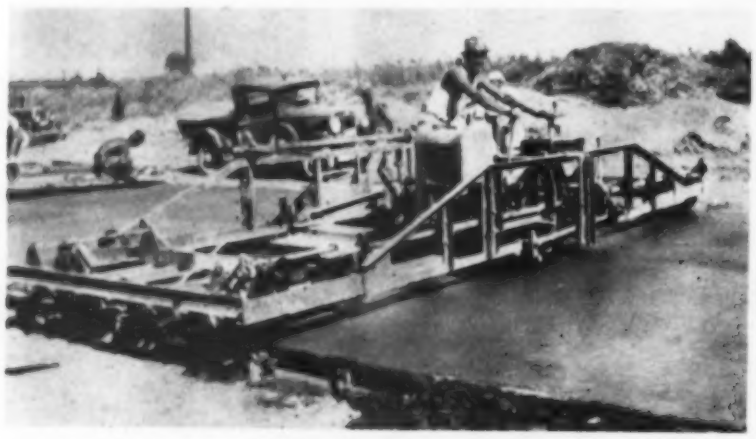
ging a bass broom across it. This finish is broomed not so much for non-skid purposes as for the purpose of eliminating light reflection. Its effectiveness is well shown on sections where the old 18-ft. slab has a smooth finish and the new 12-ft. slab constructed alongside of it has the broom finish.

Immediately after finishing the slab was covered with burlap and kept wet until early the next morning, when the burlap was removed, a little at a time, the surface being checked by an inspector for variations and then immediately covered with straw and saturated with water. Straw curing continued for 7 days before the pavement was allowed to be used.



CHANNEL CAPS are removed and hardwood strips are inserted for finishers to work to in finishing joints.

EXPANSION JOINT in place is protected by channel iron cap on top.



POWER-DRIVEN JOINT MACHINE cuts center joint in 20-ft. slab.

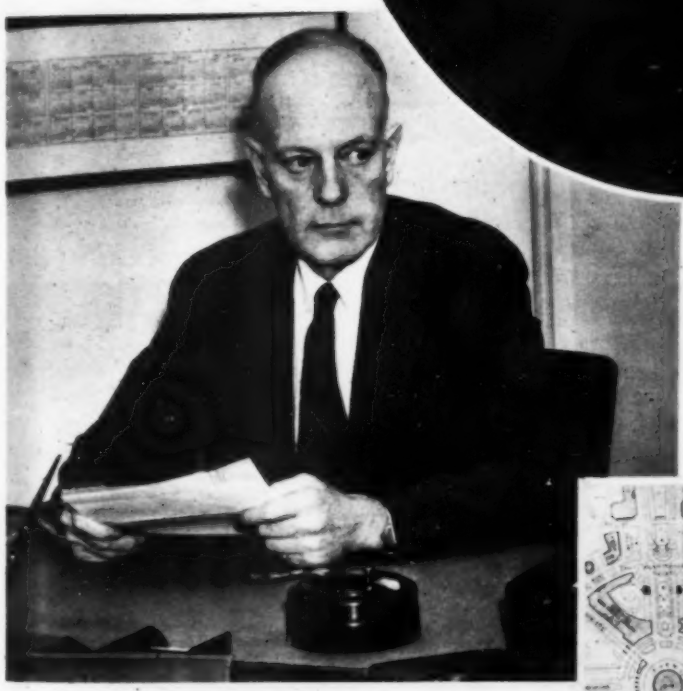
Equipment Changes—In constructing the job the contractor faced the problem of having three sets of equipment to build three different widths or of being able to change one set of equipment as the different widths were met. Tackling the first 4-mi. section, the 12-ft. slab in that section was completed. The equipment, with the exception of some of the very light and inexpensive pieces, was then shortened to 10 ft. to permit placing the 10-ft. slab in that 4-mi. Width of equipment was lengthened to 20 ft. and was left at that width until all 20-ft. slab in the next two 4-mi. sections had been placed. This method made a total of six changes; after the first change, they all could be made over night, and no time was lost. Although it saved additional equipment the method required considerable traveling with the heavier pieces, and it would be more or less an individual problem as to whether a contractor would be better off changing equipment or having sufficient for all three widths.

Present and Accounted For

Key Men in Construction Department of

New York World's Fair

CHIEF ENGINEER AND DIRECTOR OF CONSTRUCTION, combining closely related duties in one office, JOHN P. HOGAN heads department which controls all engineering and construction activities, including enforcement of Fair's building code.



ASSISTANT CHIEF ENGINEER, second in command in Construction Department, L. B. ROBERTS maintains supervision of engineering and building activities for World's Fair.

GENERAL MANAGER in charge of all operations on 1,216-acre site in Flushing Meadow Park is W. EARLE ANDREWS, former general superintendent of New York City's Department of Parks.

ARCHITECTURAL FEATURES of World's Fair structures must meet inspection and approval by IRWIN L. SCOTT, chief architect of Construction Department.

CENTRAL EXHIBIT AREA shown on wall map **(right)** is being built up under watchful eye of JOHN P. McINERNEY, superintendent of construction for New York World's Fair 1939 Inc.

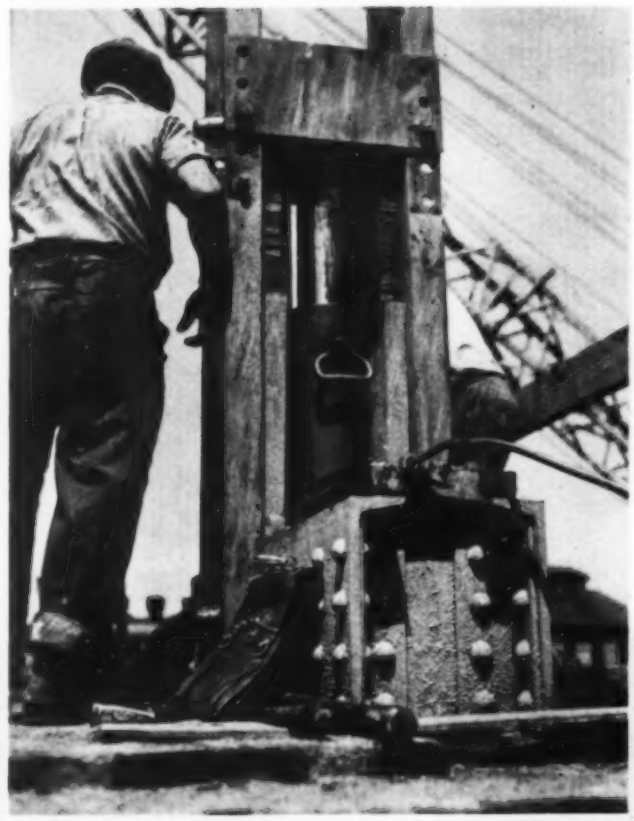
COFFERDAM BRACING

For Bridge Pier Substructure, Lowered as Unit by

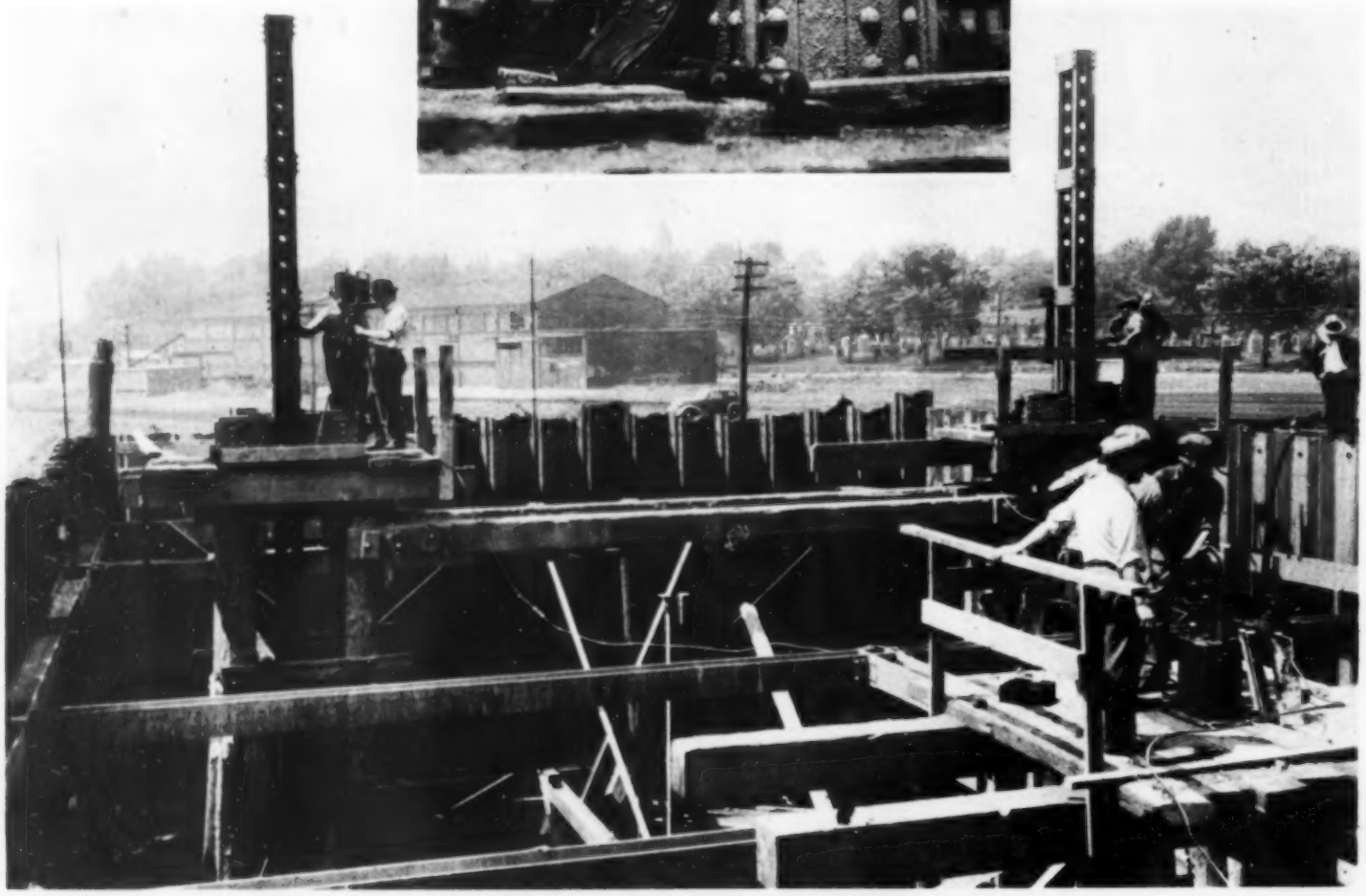
HYDRAULIC JACKS

WITH THE AID of four 60-ton hydraulic jacks mounted on elevated platforms carried by clusters of four timber piles, steel framework weighing 160 tons, to serve as interior bracing for each of two large rectangular cofferdams of steel sheetpiling, was lowered to place as a preliminary to building concrete piers to carry Meeker Ave. on a high-level bridge over Newtown Creek between the Boroughs of Brooklyn and Queens, New York City. The new Meeker Ave. bridge, with its approaches, will be about 1 mi. in length and will have a 300-ft. main steel truss span clearing high water in Newtown Creek by 125 ft., thus avoiding the necessity of a draw-bridge to pass marine traffic. The bridge will replace an old and now inadequate draw-bridge structure a few hundred feet west of the present site, and will form a traffic connection with Long Island's arterial highway system.

At the bridge site Newtown Creek is about 250 ft. wide and 30 ft. in maximum depth. To support the towers of the high-level steel structure on opposite banks of the stream the plans called for two concrete piers to be built within steel sheetpile cofferdams, each approximately 130 ft. long and 47 ft. wide. The bridge piers extend to depths, below mean high water, of approximately 40 ft.



HYDRAULIC JACKS (left). of 60 tons capacity, are mounted between lowering channels on pair of steel channels forming jacking beam. Stack of steel shims on each side of jack plunger are removed, one by one, during lowering, to prevent accidental drop of load.



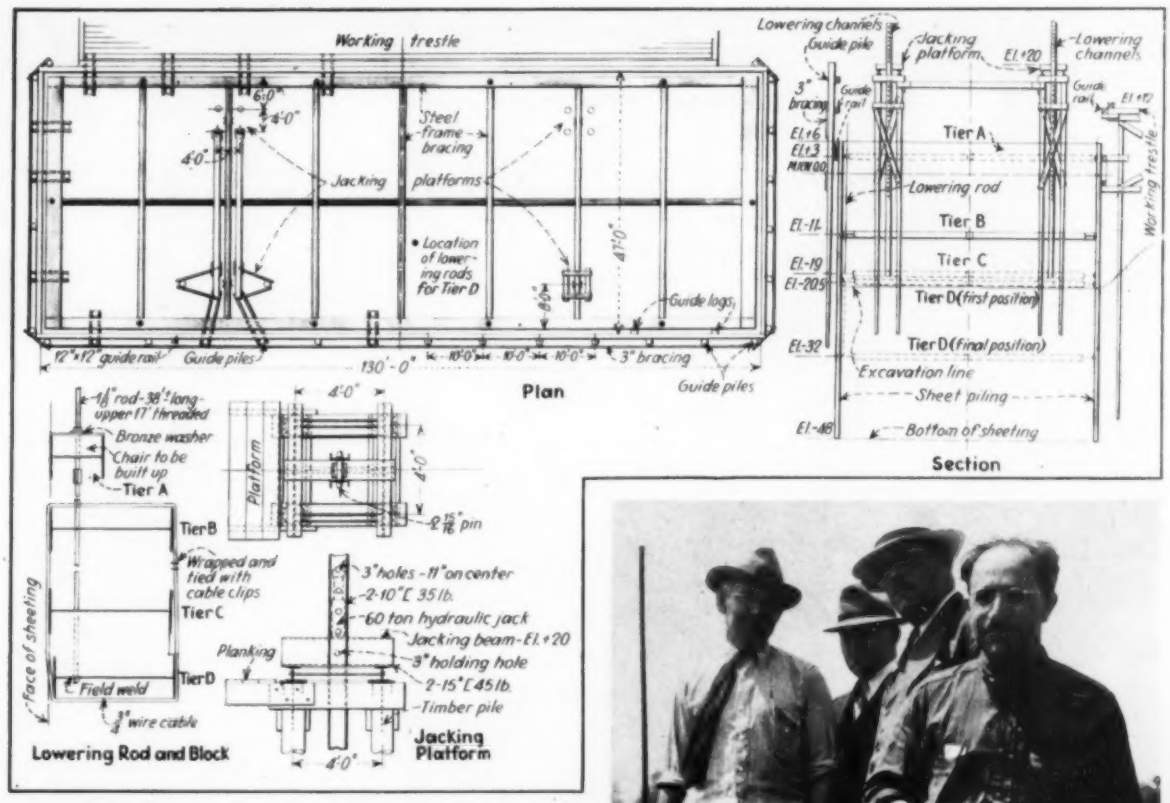
JACKING PLATFORMS near each corner of cofferdam are supported by clusters of four wood piles. In right foreground is platform supporting hand pump which supplies oil to hydraulic jacks through copper tubing.

on the north (Queens) side and 48 ft. on the south (Brooklyn) side of the creek. Methods of constructing the cofferdams for the two piers are identical. As for the piers themselves, the only essential difference is that on the Queens side it was necessary to provide sub-surface support by driving within the excavated cofferdam area 549 Bethlehem steel H-piles from 53 to 65 ft. in length, while no bearing piles were required on the Brooklyn side.

A contract amounting to $399,548 was awarded to Charles F. Vachris, Inc., of Brooklyn, N. Y., for the two main concrete piers for the channel crossing. The following notes describe the methods used in building and bracing the big sheetpile cofferdam on the Queens side of Newtown Creek.

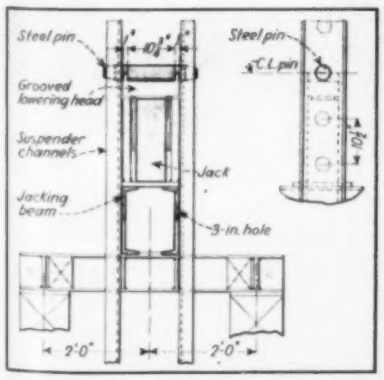
Bracing Plan

From the construction point of view the outstanding feature of the job was the method developed by Moran, Proctor & Freeman, consulting engineers, of employing hydraulic jacks to lower the four-tier steel bracing within the 130x47 ft. area inclosed by the sheetpile walls of the cofferdam. This bracing consists of a steel framework, or cage, four tiers (35 ft.), in height when in final position, made up of steel H-beams, placed with their webs horizontal and riveted to form eight bays in the 130-ft. length of the inclosure. As indicated in the accompanying sketch, only the three upper tiers, A, B and C, of the bracing, together with the vertical posts supporting them, are fabricated into a single unit. The lower tier, D, of the framework is an independent unit lashed by temporary wire rope cables to tier C and later lowered into final position by vertical rods suspended from tier A. The lowering of tier D was done after the bracing unit comprising the three upper tiers, A, B and C, suspended from four jacking platforms by vertical hangers in the form of 10-in. steel channels, had descended to grade



INTERIOR BRACING of 130x47-ft. cofferdam consists of steel H-beams fabricated into frames suspended from jacking platforms for lowering by perforated channel hangers.

CONSTRUCTION PERSONNEL on Meeker Ave. bridge inspect operation of lowering cofferdam bracing. **(Left to right):** H. ENGLANDER, superintendent for contractor; W. H. MUESER and CARLTON S. PROCTOR, of Moran, Proctor & Freeman, consulting engineers; and NATHAN DEUTSCHMAN, resident engineer for New York City's Department of Public Works.



DETAIL OF JACKING PLATFORM. showing suspender channels carried by steel pin and lowering head above plunger of jack.

within the excavated area of the cofferdam.

The reason for making the lower tier, D, of the bracing frame detachable for independent lowering by rods, instead of jacks, was to expedite the driving of the steel sheetpiling (using the upper tiers of the bracing as an inside guide) and prevent the caving in of material as excavation within the cofferdam area was removed to permit lowering of the bracing framework. With the scheme adopted sheetpile driving was started as soon as tier C of the bracing reached its final grade, El.—19.

Under the direction of H. Englander, superintendent for the Vachris company, the sequence of field operations in building and bracing the cofferdam was as follows: First, piles were driven to support a working trestle along the shore side of the

STEEL PINS (left). 2 15/16 in. in diameter, pass through holes in lowering channels and are supported by grooved head on plunger of jack.

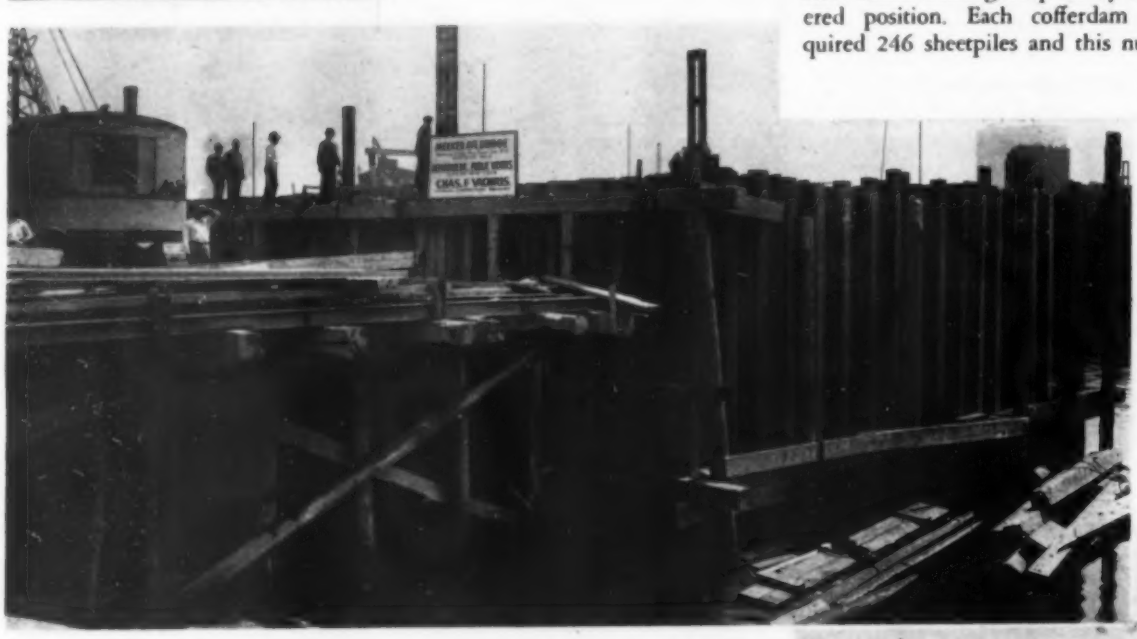
guide the subsequent placing of the steel sheetpiling.

Sequence of Operations

After these preliminaries had been completed the erection of the steel bracing framework was begun, starting with tier D. The schedule of operations followed by the contractor was as follows:

(1) Erect bracing tier D on working platform.
(2) Set blocks and erect tier C on tier D.
(3) Set temporary posts and permanent end posts and erect tier B 8 ft. above tier C; lash tier D with wire rope to tier B.
(4) Set lowering rods (for tier D) and weld lower ends to tier D.
(5) Fasten lowering channels to tier C and set holding pins in jacking platforms.
(6) Remove working platform (on which steel frame was erected) and lower tiers B, C and D to give clearance below jacking platform for erection of tier A.
(7) Set posts and erect tier A 14 ft. above tier B.
(8) With hydraulic jacks lower bracing frame to final position for tiers A, B and C, after dredging out material to El.—21; remove temporary cables holding tier D before tier B reaches water level.
(9) Drive steel sheeting for cofferdam walls.
(10) Excavate to final grade for tier D (El.—32)
(11) Lower tier D to final position and complete excavation to El.—40.

The cofferdam walls are formed of Bethlehem interlocking steel sheetpiling (DP2 section) in 54-ft. lengths; each sheet pile is 16 in. wide and has a 5-in. arched web. Before any driving was started the sheetpiles were set in position vertically by a Marion steam crawler crane with 120-ft. boom to close the cofferdam completely, and were guided to proper alignment on the outside by the walers on the line of wood piles driven outside the cofferdam area and on the inside by the steel frame bracing in partially lowered position. Each cofferdam required 246 sheetpiles and this number was set in place, ready for driving, in 2 days. Driving of the sheetpiling to El.—48 was done with a McKiernan-Terry No. 7 hammer.

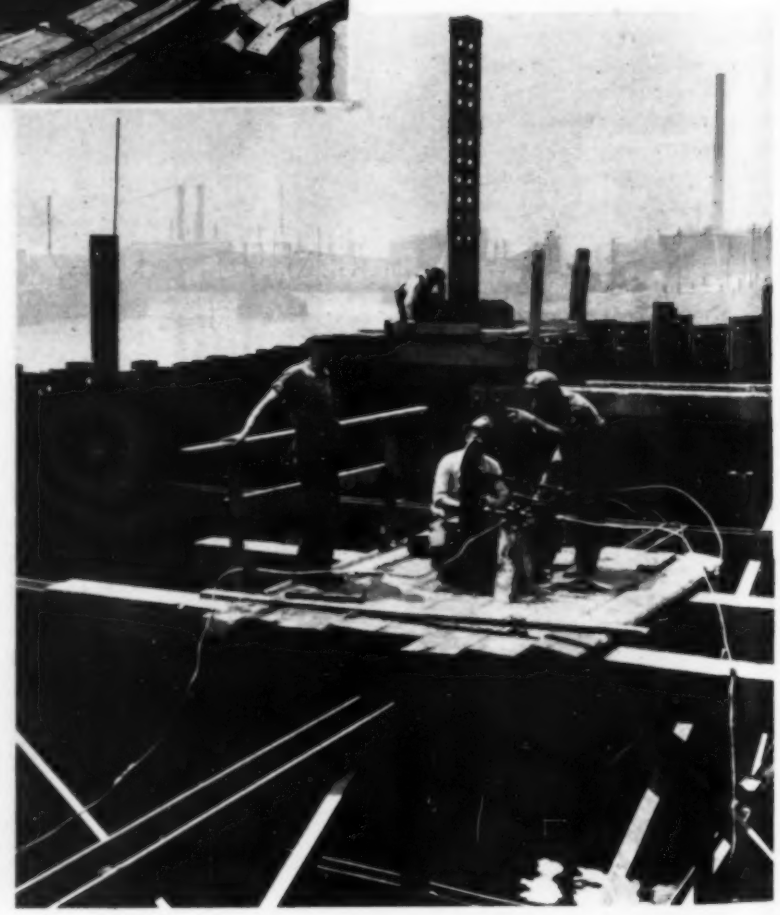


WORKING PLATFORM is built on wood piling on land side of cofferdam to carry locomotive crane which handled steel sheetpiles. Projecting above steel piles are tops of perforated channels from which interior bracing was hung from jacking platforms.

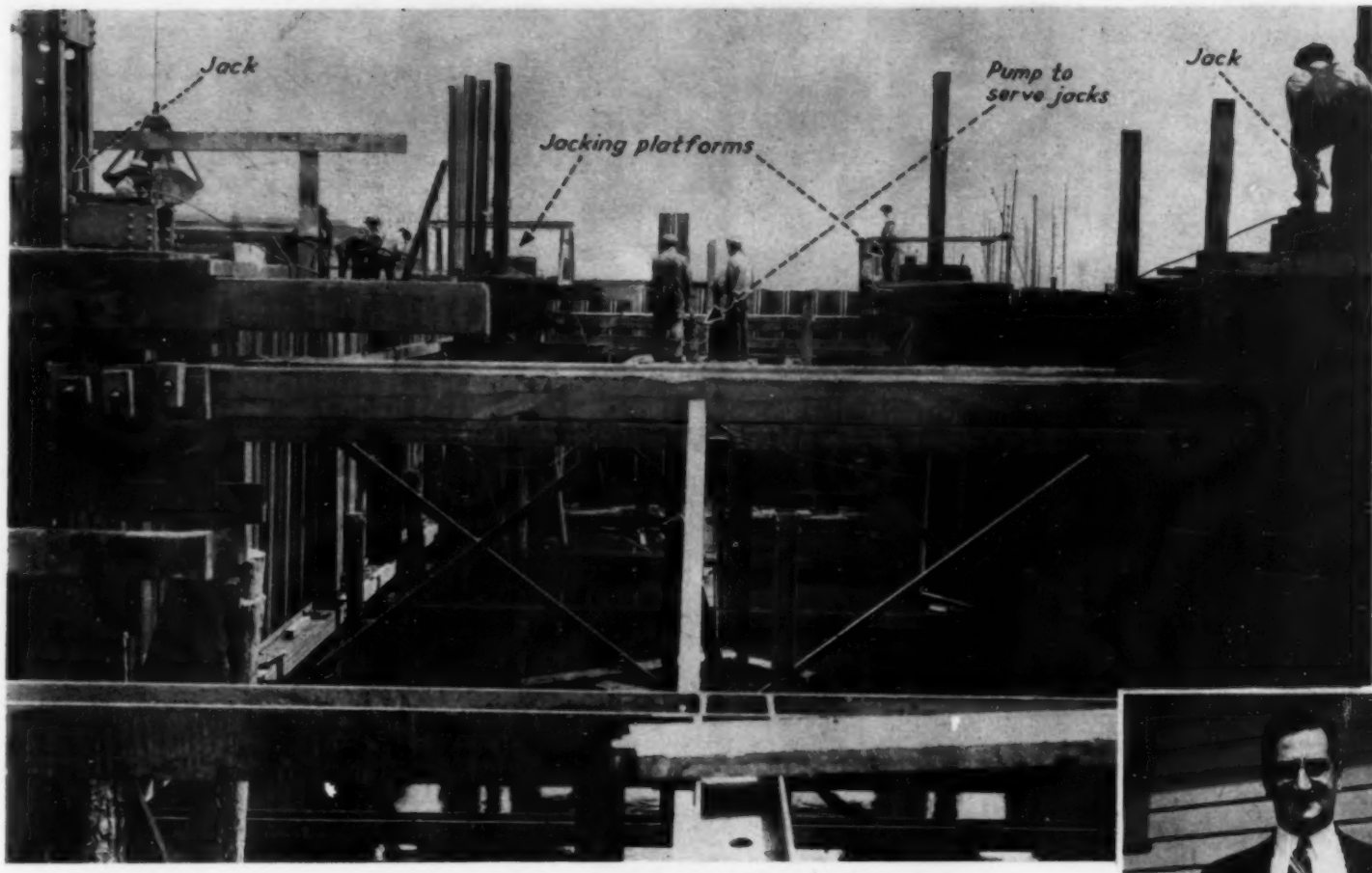
cofferdam and material from the creek bottom within the cofferdam area was dredged to El.—14. Then, after 8 test piles had been driven, a line of 50-ft. long wood guide piles, spaced on 10-ft. centers, was driven around and just outside of the rectangular cofferdam area and cleated to wood piles inside the line of sheeting to form a working platform for erecting the lower tier, D, of the steel bracing frame. Next, at the four points within the cofferdam indicated on the sketch, clusters of four piles were driven and braced to support jacking platforms 20 ft. above water level from which the steel framework bracing, suspended by four pairs of steel channels, was later to be lowered. To the line of timber guide piles around the rectangle were bolted 12x12-in. walers which, with the interior steel bracing lowered sufficiently, served to

Lowering with Jacks

After excavation within the cofferdam had been carried down to El.—21 the operation of lowering the steel bracing was begun. At the start of this phase of the work the load of the assembled framework was transferred from the pile-supported erection platforms to four pairs of 10-in. vertical steel channels, 39 ft. in length and 17 ft. above Tier A, which, connected to tier C, acted as hangers to suspend the fabricated bracing from the four jacking platforms. On each of the four elevated platforms a 60-ton Watson-Stillman hydraulic jack was seated upon a jacking beam, made of a pair of 15-in. steel channels. On top of the plunger of each jack is mounted a steel head with a semi-circular groove, or bearing area, to engage a 2 15/16-in.-diameter removable steel pin. Through the webs of each pair of vertical suspender channels, which support the load of the cofferdam bracing, are bored a series of 3-in. holes, spaced vertically 10½ in. apart on centers. Through the steel jacking beams on the platforms are similar 3-in. holes to receive 2 15/16-in. steel pins for carrying the load of the bracing while the jacks are being reset after each move. On a platform at the center of the cofferdam is mounted a hand-operated oil pump



HAND PUMP (right), on platform at center of cofferdam delivers oil to four lowering jacks through equal lengths of copper tubing.



INTERIOR BRACING of 130x47-ft. sheetpile cofferdam showing jacking platforms and vertical suspender channels by which steel frame is lowered to place.

which is connected with each of the four jacks by equal lengths of copper tubing, fitted with a stop-cock at each jack. Through a clutch the pump may be operated at two speeds, for either high or low pressure.

The lowering of the bracing within the cofferdam — a total load of 160 tons — is done in "drops" of 10½ in. Steel pins are inserted in the holes through the vertical suspender channels connected to tier C of the bracing and the load is picked up by the jacks with plungers extended to the full length of their travel. A release valve on the oil pump is then opened, allowing the plungers of the jacks to recede gradually, thus lowering the bracing a vertical distance of 10½ in. At the end of each drop the load of the bracing is transferred from the jacks to steel pins driven through the 3-in. holes in the jacking channels on the platforms. The steel pins through the suspender channels then are removed, moved up one notch (10½ in.) to the next pair of holes, the jack-plungers are extended to pick up the load again and lower it another 10½ in. By repeating this cycle the bracing was lowered a total distance of 22 ft.

Safety Detail

To prevent any accidental drop of the load during the lowering operation, due to breakage of a jack or to too rapid release of the oil pressure, a precautionary measure is taken, as illustrated in one of the accompanying photographs. With the jack plungers fully extended, just prior to starting the lowering operation, a stack of thick metal shims, each 1 in. thick, is placed between the lowering head of the jack and a pair of steel shoulders built up from the jacking beam. As lowering proceeds these shims are removed *one by one* so that, in case of accident to any jack, the load it carries could fall only 1 in., at which distance it would be arrested by the piles of shims on each side of the jack.

When the bracing has been lowered by the foregoing method until tier C has reached its proper grade (El.—19) the sheetpiling forming the cofferdam walls is driven home to El.—48. Excavation within the cofferdam then is completed to El.—40, (the bottom of the concrete pier) and tier D is lowered 11½ ft. to its final position at El.—32. Tier D, it will be recalled, is an independent unit, lashed temporarily to an upper tier of the frame by wire rope. From brackets on the upper tier, (A) of the bracing, ten vertical 1⅛-in. steel rods, about 38 ft. long and threaded for a distance of 17 ft. at their tops, extend down to connect with tier D. When ready for lowering, the load of tier D is taken up by these suspender rods, the temporary wire rope lashings to tier B are removed before tier B reaches the water level, and the steel frame bracing of tier D is let down gradually to final grade by turning nuts on the threaded rods from which it is hung. Tier D has dimensions slightly less than those of the upper tiers of the bracing in order to provide a clearance of 1½-in. with the sheetpile walls of the cofferdam and thus prevent binding during the lowering operation.

The steel sheeting, forming the cofferdams, will be burned off to elevations shown on the drawings. In general the sheeting along the pier-head line and back to the channel faces of the piers will be burned off to El.—28. From here the cut-off levels will step upward toward the land sides of the piers, the sheeting on the land sides to be burned off to El. 0. Bracing which occurs below the tops of the tremie concrete seals may be left in place; bracing between the tops of the seals and El.—9 can be left in place if located so as not to impair the strength of the concrete members of the piers. Above El.—9 all bracing must be removed.

Personnel — The Meeker Ave. bridge is being built under the direction of New York City's newly reorganized Department of Public Works, of which Major-General Edward M. Markham, former chief of engineers, U. S. Army, is commissioner, Major Irving V. A. Huie, chief engineer and acting deputy commissioner, S. Hamburger, director of bridges, and Nathan Deutschman

GENERAL MANAGER for Charles F. Vachris, Inc., Brooklyn, N. Y., contractor, is MOSES HORNSTEIN.

resident engineer for this project. For the contractor, Charles F. Vachris, Inc., Moses Hornstein is general manager and H. Englander superintendent in immediate charge of construction. Consulting engineers on the project are Moran, Proctor & Freeman, of New York City.

Bid Prices

For the two cofferdams and concrete piers of the Meeker Ave. bridge the Vachris bid totalled $399,548. Lump sums or unit prices for the major items were:

Sheetpiles and bracing frames for two cofferdams, each 130x 47 ft.	$130,000
Excavation per cu.yd.	$1.15
H-beam bearing piles, per lin.ft.	1.85
Tremie concrete for seals (without cement)	5.50
Concrete for piers above seals (without cement)	8.40
Portland cement, per bbl.	2.25
Steel reinforcement, per lb.	.05
Anchor bolts, per lb.	.10
Granite masonry, per cu.ft.	5.50

PRIZE-WINNING BRIDGES

THE MOST BEAUTIFUL BRIDGES of four classes built during 1937, according to the selections of a Jury of Award appointed by the American Institute of Steel Construction, are:

Class A (Monumental) — Golden Gate bridge, San Francisco, Calif. Total cost, $27,000,000.

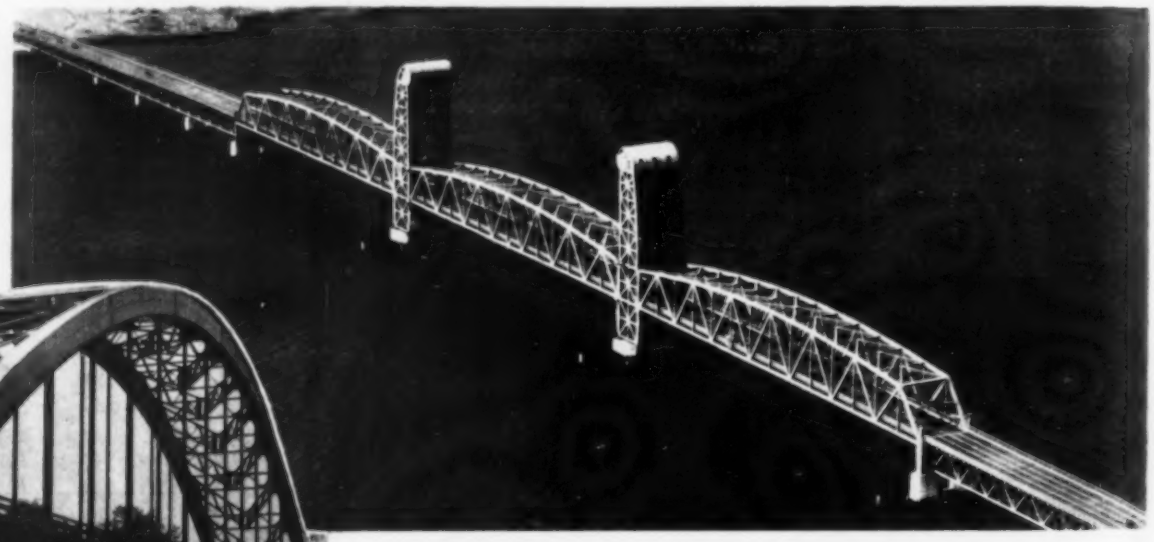
Class B (Medium Size) — Little Hell Gate low-level bridge, New York, N. Y. Total cost, $530,000.

Class C (Small Size) — Chesterfield-Brattleboro bridge, New Hampshire. Total Cost, $198,426.

Class D (Movable) — Marine Parkway bridge, New York, N. Y. Total Cost, $3,750,000.

The jury selecting the prize-winning bridges consisted of: Prof. H. E. Wessman, College of Engineering, New York University; William H. Yates, consulting engineer, New York City; L. Andrew Reinhard, of Reinhard & Hofmeister, architects, New York City; William Lescaze, architect, New York City; and Kenneth Reid, editor, "Pencil Points," New York City. The bridges winning the prize awards will be decorated with stainless steel plaques donated by The American Institute of Steel Construction.

CLASS A — GOLDEN GATE BRIDGE. San Francisco. Main suspension span 4,200 ft.; total length, 9,200 ft. Cost $27,000,000. Joseph B. Strauss, chief engineer; O. H. Ammann, L. S. Moisseiff and Charles Derleth, Jr., consulting engineers. Fabricator, Bethlehem Steel Co. Owner, Golden Gate Bridge and Highway District.



CLASS C — CHESTERFIELD-BRATTLEBORO BRIDGE, over Connecticut River, New Hampshire. Span length, 425 ft. Cost, $198,426. John W. Childs, bridge engineer and Harold E. Langley, designing engineer, New Hampshire Highway Department. Fabricator, Bethlehem Steel Co., Bethlehem, Pa.

MOVABLE TYPE — MARINE PARKWAY BRIDGE. New York City. Length of lift span, 540 ft. Cost, $3,750,000. Madigan-Hyland, consulting and supervising engineers; Waddell & Hardesty and Robinson & Steinman, consulting engineers; Aymar Embury, II, consulting architect. Fabricators and erectors, American Bridge Co. Owners, Marine Parkway Authority.

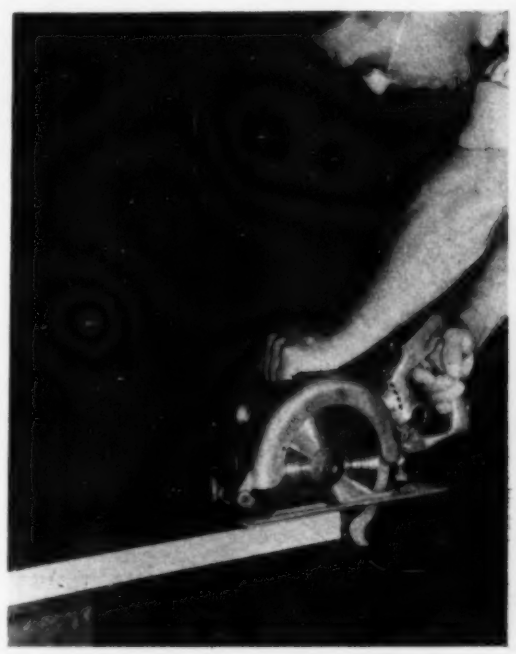
CLASS B — LITTLE HELL GATE BRIDGE, (low level), New York City. Three spans of 167, 280 and 242 ft. Cost, $530,000. O. H. Ammann, chief engineer; Allston Dana, engineer of design; Aymar Embury II, architect. Fabricator, American Bridge Co. Owner, Triborough Bridge Authority.

CONSTRUCTION EQUIPMENT NEWS

Review of Construction Machinery and Materials for AUGUST, 1938

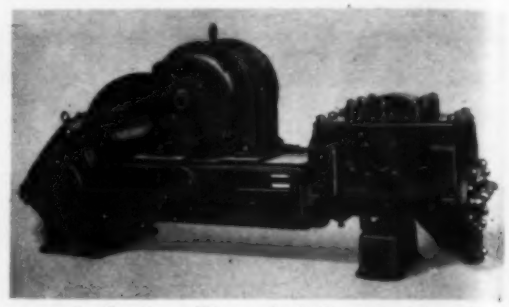
LIGHTWEIGHT SMALL MIXER of 3½-S capacity is of high-speed trailer type, mounted on two-wheel pneumatic tired carriage, and weighs only 930 lb. End discharge of Mascot model eliminates back and forth wheelbarrow travel. Powered by 2½-hp. vertical type air-cooled one-cylinder gas engine — no freezing of water in winter. Hardened roller chain connects engine sprocket with drum drive spocket. Welded frame and drum construction insures strength. Hand wheel turns pinion meshing with large internal gear connected directly with drum. Friction brake stops and holds drum in any discharge position; counterbalance returns drum automatically to charging position. Adjustable lug stops drum in same position for each batch. Wide 18-in. drum opening permits quick charging. Anti-friction bearings save wear. Mixing blades are self-cleaning. Overall dimensions: Length, 42 in.; width, 66 in., height 60 in. — **Kwik-Mix Concrete Mixer Co., Port Washington, Wis.**

FOR CORE DRILLING a new type of bortz-set bit, called Koebelite Korbits, is claimed to show savings of from 15 to 20 per cent in bit cost per foot of hole and to increase drilling speed. Bits have large number of cutting points and accurate gage. Bortz-bearing inserts fit into radial slots in bit blank and are firmly brazed into blank. Ample water clearance. C. J. Koebel, of Detroit, developed process by which stone-bearing insert or metal-matrix, and the stones, are molded and integrally bonded together. Even temperature changes, it is claimed, can not affect this bond. — **Sullivan Machinery Co., Michigan City, Ind.**



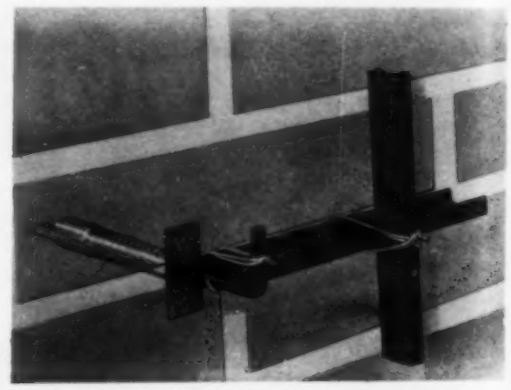
PORTABLE ELECTRIC SAW, new 7-in. size, of interest to carpenters, builders, contractors and woodworking plants, features double power, safety, balance, versatility, less weight. Has 2⅜-in. maximum depth cut and handles all popular lumber sizes. Motor power has been doubled in comparison to former models and is transmitted by efficient worm gears to deliver maximum power at blade. Cool motor operation assured by proper ventilation with an efficient fan and ample vent slots. Close-coupled design has materially reduced weight and length of saw providing excellent operating balance and assuring minimum of user fatigue. In addition to adjustable depth of cut, saw table may be tilted for angle and bevel cutting and locked at any angle from 0 to 45 deg. Provided with detachable, adjustable rip-fence for measuring and guiding rip cutting up to 6 in. wide. Various types of blades and abrasive disks for use in rip-sawing, cross cutting, metal cutting, slotting marble, asbestos, transite, tile and porcelain. — **The Black & Decker Mfg. Co., Towson, Maryland.**

DUPLEX POWER PUMPS for oil field service, fire protection and for general service requiring pressures up to 800 lb. per square inch and capacities to 187 g.p.m. Features: (1) Herringbone gears that insure smooth flow of power to fluid end with mini-



mum of vibration; (2) crank-shaft and pinion-shaft roller bearings that reduce mechanical friction to minimum; (3) improved line type fluid end. Offered with fluid end piston stroke of 10 in. and with cylinder diameters of 2½ to 5 in., providing capacity range of 40 to 187 g.p.m. at pressures from 250 to 800 lb. per square inch. Furnished alone, with pulley for belt drive or with top-mounted motor and silent chain drive. — **Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill.**

WALL FURRING ANCHOR, with adjustable feature, offers simple means of attaching furring channels to masonry walls and prevents seepage of moisture to plaster. Device consists of two parts, a socket 4 in. long, of 24-gage sheet steel, with 7/16-in. thick body grooved top and bottom, and a channel bracket of malleable iron 4½ in. long and 11/32 in.



thick, flattened for quick axial adjustment and provided with teeth on upper and lower sides to engage grooves in socket. Sockets are built into wall at any desired spacing. Lather inserts channel bracket flatways into socket until its angle head touches the stretched runner-channel line. Then the bracket is given a quarter turn to lock it in upright position in the socket. Horizontal channel is then wired to bracket and vertical channels are wired to horizontals, as illustrated. — **K-M Products Co., Milwaukee, Wis.**

HIGHWAY MAINTENANCE TRUCK, built to withstand grueling operating conditions encountered in this type of work, has specially constructed transfer case built so that clearance of 23 in. under driving mechanism permits installation of underbody scraper or other necessary maintenance equipment. Speed

in high gear with engine governed at 2,500 r.p.m. and with standard tires as equipment can reach 37.4 m.p.h. Five speeds forward and one reverse and selective sliding gear-type transmission are other features. Rated capacity, 2 tons. Gross rating, 16,000 lb. Six-cylinder motor has bore and stroke of 4⅛x4¼ in., piston displacement of 381 cu.in., develops 85 hp. at 2,500 r.p.m. and has torque of 256 lb.-ft. Four-wheel hydraulic brakes. Tires are 7.50x20 in., with singles on front and duals on rear wheels. — **Four Wheel Drive Auto Co., Clintonville, Wis.**

FIRE-RESISTANT WALL BOARD for interior and exterior wall construction for factories, homes, garages, filling stations, cabins, vent ducts and spandrels, is composed of insulating core of Celotex surfaced on one or both sides with asbestos-cement. Dense, light gray stone-like surface is bonded to

rot-proofed, termite-proofed Celotex core by waterproofing adhesive, providing permanent, all-weather laminated construction and is said to have high reflectivity and good wearing qualities. May be drilled and handled with regular woodworking tools. Applied with nails, screws or bolts, depending upon base to which it must be attached. Particularly useful in wide spaced steel and wood construction. Manufactured in panels 4 ft. wide and from 6 to 12 ft. long, and in four thicknesses of Celotex, ½ in. to 2 in., surfaced on one or both sides with ⅛-in. layers of asbestos cement. — **The Celotex Corp., 919 N. Michigan Ave., Chicago, Ill.**

CABLE GUARD RAIL utilizes special bumper-type bracket said to combine both security and resilience, and cables made of any specified number of either hot dip galvanized or bethanized (electrically coated to give them an extra thick and flexible coating of

zinc). Bracket does not require any auxiliary equipment to hold cables in place while erecting. Cables fit into grooves in clips which may be inserted into bracket, already fastened to post, to allow for adjustment of cables before bolts are fully tightened to complete erection of guard rail. Special button-head bolts fasten clips to bracket. Grooves in clips are of ample area to permit free longitudinal movement, eliminating wear on cables. Entire bracket so designed that a vehicle cannot strike any sharp points or projections. — **Bethlehem Steel Co., Bethlehem, Pa.**

WASTED TIME—at $20.00 AN HOUR!

Tractor breakdowns kept equipment idle . . . when minutes meant dollars

THE Hobbs-Wall Logging Company, of Crescent City, California, were experiencing the unpleasant sensation of watching profits dribble through their fingers. Their 75-H.P. Diesel tractors were breaking down, causing delays and keeping equipment idle at an estimated cost of $20.00 per hour!

Shell engineers went to work with Kenneth Cunningham, tractor engineer, and Chas. Martin, woods supt.

The Hobbs-Wall tractors, used for dragging heavy logs over rough ground and working at extremely high temperatures, were breaking down due to heavy sludge formation and sticking rings and valves.

After noting all operating conditions and making a thorough examination of the Diesels, Shell engineers recommended the proper Shell Lubricant.

The Hobbs-Wall Company found immediate satisfaction. They report engines "operating cooler" with no more valve and ring sticking. They further claim a substantial saving in lubricants alone. Most important of all—delays which were formerly so costly have been completely eliminated!

Are you a Diesel operator? Then this case history from the Shell files is important to you. It is but *one* example of the way Shell men are getting *results* with Shell Industrial Lubricants. Shell has a mighty big "plus" to offer you. Hard-headed, practical experience, gained in every industry, coupled with the finest lubricants on the market today. This "plus" is always ready to meet *your* problems. Call or write your nearest Shell office.

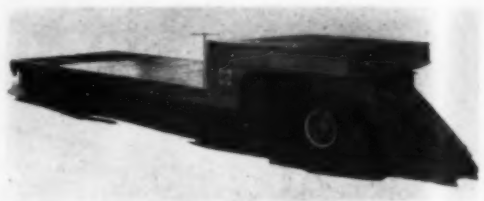
SHELL

SHELL CONSTRUCTION LUBRICANTS

¾-CU.YD. EXCAVATOR built to work in close clearances is said also, because of mobility and ease of operation, to be ideal for crane service. Some features listed by its makers: Self-cleaning, non-binding crawlers; boom of tubular construction or maximum strength; full capacity, ¾-cu.yd. manganese steel front dipper; full-welded construction throughout; simple arrangement of controls; ease of convertibility; maximum operating speed obtained by proper balance of machinery units, conveniently arranged operating levers, clear vision of operator and easily actuated large-diameter clutches.—**Marion Steam Shovel Co., Marion, Ohio.**

TRAILER FIELD OFFICE used by Wean Engineering Co., whose contracts for erection of machinery in all parts of the country necessitate complete living and office quarters on various jobs—sometimes in almost inaccessible locations. Built of steel, this type of

office stands up well on roads to and from construction sites. Eliminates necessity of packing and repacking plans, blue prints and surveying equipment. Offers protection to men and valuable instruments in all sorts of weather. When job is completed tow car quickly moves mobile office to new location, greatly decreasing time losses in moving and setting up new field office.—**Bender Body Co., West 62nd & Denison, Cleveland, Ohio.**



LIGHTWEIGHT UTILITY TRAILER, 5 to 15 tons capacity, for transportation of lighter types of machinery, such as tractors, compressors, pumps, small shovels and cranes. Dual-type wheels of heavily reinforced cast steel; roller bearings; heavy-duty, full balloon pneumatic tires. Either four or six wheels available. To expedite loading of machinery on to low flat deck of trailer, entire front axle assembly is removable through arrangement at front end of trailer frame which serves both as a connection and a turntable for front axle. Loading made easier by heavy jackscrew built into coupling assembly which will raise or lower trailer frame to accommodate practically all jobs with safety. Other features: Adequate loading ramps; lash rings riveted to side frames, reflectors, flag sockets and heavy-duty safety chains—**C. R. Jahn Co., 228 North LaSalle St., Chicago, Ill.**

INDUSTRIAL CURTAIN WALL for steel frame factory buildings consists of application of incased insulating board (1 in. of insulating board with ⅛-in. veneer of asbestos Flexboard or flat Transite) over which is applied wall of corrugated Transite. Between windows, wall is constructed of incased insulating board to which is cemented ⅜-in. sheet of flat Transite to form exterior effect. Ready for erection upon arrival at job. Provides fireproof walls, not only incombustible but also

capable of withstanding high temperatures without melting, cracking or buckling, assuring maximum protection against spreading of flames to or from adjoining buildings. Light weight of sheets lessens load to be carried by steel frame of building and permits use of lighter members in its construction. Board units held against steel framework by cadmium plated bolts, and gray calking compound is applied to edge of each sheet. No expansion joints necessary. Material may be sawed, drilled and fitted into place with ordinary carpenter's tools. Relocation of walls possible with almost complete salvage of materials. No painting required, but if color other than light gray is desired, walls may be painted after receiving priming coat of boiled linseed oil.—**Johns-Manville Co., 22 E. 40th St., New York City.**

NO EXPENSIVE DELAYS HERE!

"Shield-Arc" welding is on the job

Photos courtesy Brown & Root, Inc., and McKenzie Construction Co.

A *Replacing rivets of a dragline boom with welded joints, made with a Lincoln Welder and "Fleetweld 5" Electrode.*

B *Repairing a broken sprocket on a power shovel with Lincoln Welder and "Stainweld A" Electrode.*

C *Hard-facing the wearing surface of a sand classifier baffle plate with a Lincoln Welder and "Abrasoweld" Electrode.*

D *Night view of the Marshall Ford Dam taken from the bank of the Colorado River.*

THE CONTRACTORS at Marshall Ford Dam, Austin, Texas, save many a day (and night) by keeping valuable construction machinery on the go with four Lincoln *"Shield-Arc"* Welders and Lincoln Electrodes. Their savings in time and money are typical of those made by Lincoln-equipped contractors the world over . . . savings such as these:

EQUIPMENT KEPT GOING	DELAY FORESTALLED	PART REPAIRED	REPLACEMENT COST SAVED
Power shovel	2 days	Center drive gear	$125.00
Compressor	20 days	Frame	850.00
Truck	2 days	Engine block	69.00
Dump truck	6 hrs.	Body	37.50
Rock crusher	Not emergency	Set of hammers	115.00
Aggregate plant	11 days	Conveyor gear	96.00
Power shovel	Not emergency	Dipper teeth	42.00
Pump	10 days	Housing	1650.00
Tractor	4 days	Sprocket	83.00
Paver	3 days	Gear	30.15
Power shovel	3 weeks	Frame	506.00

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Send Free copy of ☑ Welding in Construction Work.
☐ "How to Make it Wear Longer."

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ELECTRIC MOTOR-DRIVEN SAFETY SAW works like hand saw and has cutting capacity of 3¼ in. Tilting base enables machine to make bevel cuts up to 45 deg. in 2½-in. material. Equipped with stationary and swinging guards which keep cutting edge of blade covered at all times, affording protection to operator. Heat-treated aluminum alloy housing. Gears consist of heavy-duty, ground, heat-treated alloy steel worms and oversize bronze worm wheel which run in large grease chamber, assuring constant lubrication and smooth operation. Other features: momentary contact, heavy-duty double-pole switch; positive chord clamp; notched base for ease in following cutting line. Packed in metal carrying case with one combination saw blade, ripping gage, wrench, lubricant and heavy rubber covered three wire cable. Other saw blades (⅞-in. arbor hole) extra equipment. — **Stanley Electric Tool Division, The Stanley Works, New Britain, Conn.**

MOTORCOMPRESSOR, a stationary, vertical, single acting, two-stage unit, combines motor and compressor as single compact machine. Compressor crankshaft carries motor rotor, and compressor frame carries motor stator. Flexible coupling and V-belt drives also are available. Sizes range from 15 to 75 hp. for discharge pressures from 80 to 125 lb. per square inch. Piston displacements range from 79 to 445 cu.ft. per minute. — **Ingersoll-Rand Co., Phillipsburg, N. J.**

PORTABLE PIPE VISE accommodating pipe from ⅛ to 2 in., may be readily and firmly attached to bench, post or other support without use of bolts or screws. Clamp member integral with base. Clamp screw set at slight forward angle carries swivel with thin V-lip projecting from upper edge permitting rigid attachment of vise to bench, or other support. Drop-forged jaws are saw tempered for file sharpening — **J. H. Williams & Co., 75 Spring St., New York**

AN IMPORTANT ANNOUNCEMENT
For Earth Movers

A New 6-Yard Cable Scraper
A New 8-Yard Cable Scraper

• LOW in first cost . . . Low in maintenance cost . . . with a pan and cutting edge that assures big pay loads with minimum tractor effort.

With the introduction of these new, efficient, economical machines, The Austin-Western Line now includes three sizes of single cable scrapers . . . 5, 6 and 8-yard . . . and the A-W 12-Yard Hydraulic Scraper.

The new 6 and 8-Yard Units are similar in operating principle to the popular job-proved A-W 5-Yard Scraper A single cable and winch, operated from the tractor, controls every operation . . . reducing maintenance expense . . . simplifying operation . . . speeding up digging and dumping time on every trip.

Write for Details of Construction, Operation and Price

THE AUSTIN-WESTERN ROAD MACHINERY CO.
1814 Barrows Street, Aurora, Illinois

6-8S-854

Austin-Western

NEWS FROM MANUFACTURERS *About Their Products*

The publications reviewed below, will keep you posted on latest developments in construction equipment and materials available for your use.

SAFETY SHOES—**Lehigh Safety Shoe Co.,** Allentown, Pa. (32 pp., illustrated). Steel toe box built into leather shoe prevents foot injuries. Shoes are made in several styles and in black and brown colors. Also rubber knee and full hip boots. Compression tests indicate that load of about 5,000 lb. is necessary to smash steel toe box of shoe. Ten pages of booklet are devoted to line of safety shoes and remaining 22 pages present statistics on industrial accidents and how the worker should be protected against them.

• • •

BLADE GRADERS—**Caterpillar Tractor Co.,** Peoria, Ill. (32 pp. illustrated). Mechanical features of these machines enumerated and discussed. Advantages of type of construction which company employs in four sizes of graders explained by means of pictures and concise text. Contains action photographs and specific examples of machines' accomplishments.

• • •

BLOW-OFF VALVES—**Hancock Valve Division, Manning Maxwell & Moore, Inc.,** Bridgeport, Conn. (4 pp. illustrated). Describes new blow-off valve with "Blo-Deflector" protecting lip said to defy wear and leakage. Lists advantages of use of these valves as follows: (1) Seat stays tight—minimizing repair costs; (2) simple design—fewer parts; (3) easy to operate. Diagram illustrates distinctive features of valves. Table showing how to select blow-off valves to meet today's A.S.M.E. requirements.

• • •

MOTOR MIXERS and AGITATORS—**Chain Belt Co.,** Milwaukee, Wis. (44 pp., illustrated.) Illustrates details of Rex moto-mixers and agitators in all standard sizes from 1 to 7½ cu.yd. Outstanding features include fast-mixing cone-end drum, safety 3-point drum mounting, one-lever, non-gear shifting drum control, outside discharge control, shock-absorbing drum drive, one-man jiffy spout, and non-flooding water tank. Cone-end drum is designed large enough in diameter to facilitate full-batch loading and to assure end-to-end mixing action. Complete specifications.

• • •

STEEL SHEETPILING—**Inland Steel Co.,** 38 S. Dearborn St., Chicago, Ill. (16 pp. illustrated). Illustrated booklet, showing wide range of steel sheetpiling installations, also the shapes and sizes of piling sections rolled. Technical information includes chemical analysis of the special steel used for piling sections and brief reports of the installation methods followed in the projects illustrated. Included among these are several pictures made during the building of cofferdam for the Grand Coulee Dam. Booklet offers free to interested persons a Cofferdam Calculator developed by the Inland Engineering Department. By means of several sliding scales, this calculator shortcuts the time necessary to estimate a piling job.

• • •

HAULING SCRAPERS—**J. D. Adams Co.,** Indianapolis, Ind. (8 pp., illustrated.) Tractor-hauled scrapers in sizes of 5, 6, 8, 10 and 12 cu.yd. Double cable control, one cable governing depth of cut and spread, and the other the front apron and dumping. Operation is through two-drum hoist connected to power takeoff of tractor. All-welded box-type construction of frame and full-length, one-piece rear axle.

TRACTOR HOISTS AND WINCHES — **Willamette Hyster Co.,** Portland, Ore. (65 pp., illustrated.) Photographs and drawings of wide range of applications of Hyster-equipped Caterpillar tractors, offering mobile hoisting and pulling service through use of "donkeys" and towing winches designed for installation on tractor rear end. Donkey models include single and double-drum units, with maximum line pull of 32,000 lb. at 108 ft. per minute. Fields of application include road and bridge building, general construction, industrial service, railroad work, public utilities, sand and gravel plants, logging, oil fields, and mining.

• • •

ELECTRICAL EQUIPMENT FOR POWER SHOVELS — **Westinghouse Electric & Manufacturing Co.,** East Pittsburgh, Pa. (24 pp., illustrated.) Developments in "variable voltage" system of operation for all but smallest sizes of electric shovels. Features of Westinghouse motors that adapt them to shovel service. Curves show rating and operating characteristics for shovel generators. Magnetic contactor controls and master switches. Drum controllers for smaller sized shovels. Non-breakable resistors and inclosed switch gear.

• • •

CARPENTERS' MANUAL FOR INTERIOR FINISH — **Celotex Corp.,** 919 North Michigan Ave., Chicago, Ill. (80 pp. illustrated.) Text and detailed working drawings tell in simple terms how to apply Celotex materials to achieve decorative interiors for homes, offices, stores and theatres. Covers uses of tile board, finish plank, texboard and building board. Applications to joists, studs or furring strips. Recommendations for laying out ceilings in square tile, basket weave, herringbone, oblong, and odd shape patterns. Suggestions for wall treatments. Joint details, beveling, grooving and carving, with illustration of special tools for these purposes. Painting and decorating Celotex tile, plank and building board.

• • •

CENTRIFUGAL PUMPS—**Goulds Pumps, Inc.,** Seneca Falls, N. Y. (8 pp. illustrated). Describes and illustrates complete line of single stage, side suction, ball-bearing units, which consists of eighteen sizes with capacities from 5 to 1,800 g.p.m. against heads up to 110 ft. for flat, V-belt or direct-motor drive. Includes tables showing sizes and dimensions, performance charts and also a typical sectional view illustrating advantageous features of construction and list of specifications.

• • •

PATROL SWEEPER—**Austin-Western Road Machinery Co.,** Aurora, Ill. (8 pp., illustrated.) Three-wheel, gasoline-powered broom machine on pneumatic tires for city street cleaning service and use in industrial plants, warehouses and piers. Cleans 5½-ft. width at single pass. Dirt hopper is dumped by hydraulic control lever. Effective for cleaning gutter areas. Picks up as it sweeps. Equipped with 20-in. gutter brooms and 36 in. diameter, 4-ft long rear pick-up broom.

• • •

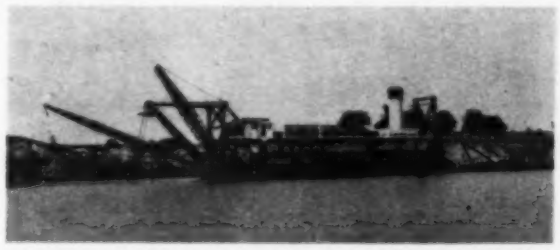
WOOD TANKS — **National Tank & Pipe Co.,** Kenton Station, Portland, Ore. (121 pp., illustrated.) Data, designs and reference tables on wide variety of wood tank installations. Describes how tanks and their foundations are designed and erected. Detailed specifications. Tank connections. List prices. Covers plain water tanks, industrial and chemical tanks, surge tanks, settling and filter tanks, oil tanks, railroad tanks, truck tanks. Company's engineering service department will give advice on all wood tank problems.

• • •

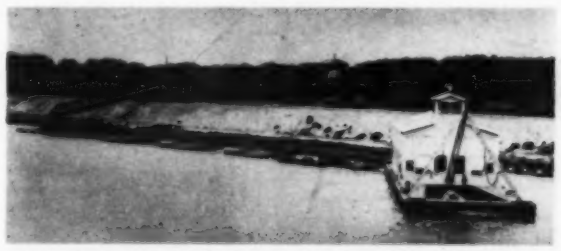
PIPE JOINTS AND REPAIRS—**S. R. Dresser Mfg. Co.,** Bradford, Pa. (12 pp., illustrated.) Helpful information for construction and operating men on how to join and repair plain end pipe with Dresser couplings, clamps and repair sleeves. No threading, beveling, grooving or drilling. Only one tool, a wrench, is needed in making joints. For stopping leaks repair clamps are available for bell-and-spigot joints and screw couplings. Repair sleeves for major breaks in pipe lines.

Turning Out Big Yardage

One of the four pipe-line dredges at Ft. Peck Dam, in Montana. Each is equipped with two G-E 2500-hp main-pump motors, a G-E 700-hp cutter motor, and G-E control and switchgear



The dredge *Gulf Stream*, owned by the McWilliams Dredging Company, of Chicago and New Orleans. A G-E 4000-hp steam turbine drives the main pump, and a G-E 750-kw turbine-generator supplies current for the other operations



This 28-inch dust-pan dredge, equipped with G-E synchronous main motor and G-E variable-voltage auxiliary drives, operates in the Loup River Public Power and Irrigation District, Columbus, Nebraska.

The *Marshall C. Harris*, a 27-inch suction dredge owned by the American Dredging Company, of San Francisco and Oakland. Speed of the main pump is controlled by the money-saving G-E Scherbius system of control

The Great Lakes Dredge and Dock Company uses this diesel-electric dredge, *Crest*, in the Atlantic Division of the company on all kinds of heavy dredging. The motors and generators with variable-voltage control are General Electric

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with

G-E Equipped Dredges

WHETHER keeping channels clear or building mighty earth dams, G-E equipped dredges turn in consistent high-yardage records.

Take the four dredges at Ft. Peck, for example. During the 1937 working season, of 249 days, they pumped 31,672,400 yards of material into the earth-fill dam. That's maintaining an average of 5,900 cubic yards per hour.

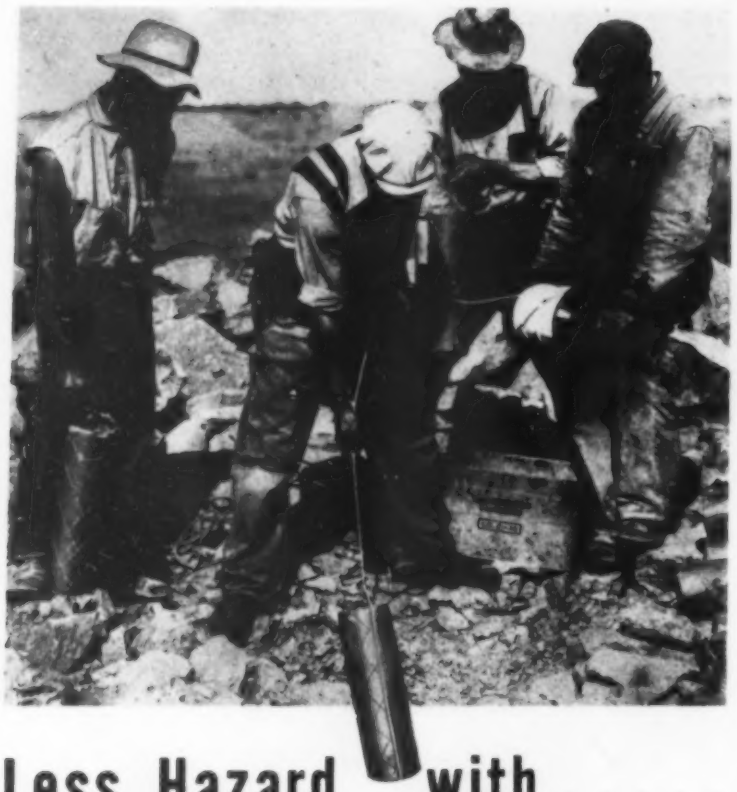
As a result of this fast rate, the earthwork will easily be finished during the 1938 working season--a year ahead of schedule!

On all sorts of construction projects you'll find that the correct electric equipment will help you get the speed that cuts time schedules. For any type of electric equipment, just call the nearest G-E office. General Electric Company, Schenectady, New York.

YOU GET GREATER SPEED AND SAFETY, MORE SERVICE FOR YOUR MONEY, WHEN YOU SPECIFY G-E EQUIPMENT

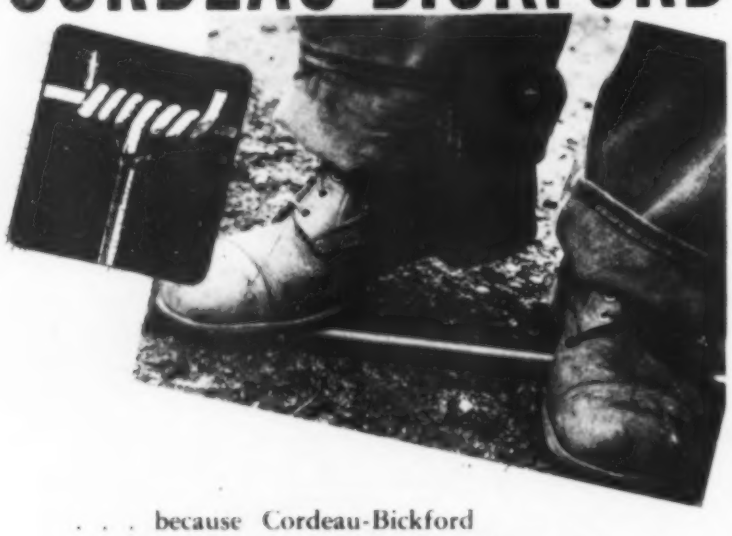
GENERAL ELECTRIC

Filing No. 162 011-341



Less Hazard with . . . . .

CORDEAU-BICKFORD



. . . because Cordeau-Bickford Detonating Fuse is insensitive and cannot be set off by friction, fire or any ordinary shock. Blasting caps are eliminated from the holes, permitting safer, easier and quicker loading. The danger of burned holes is likewise minimized. Only when the blast is ready for firing is a blasting cap attached, being placed then on the main line. After the shot further danger is also reduced, since there can be no unexploded caps remaining in the blasted material.

CB75

CORDEAU·BICKFORD

Detonating Fuse

THE ENSIGN-BICKFORD COMPANY • SIMSBURY • CONN.

WHY use 1000 FORM TIES when 500 will do the trick

and do it Better?

Form ties are cheap enough, you say! Maybe so! But how about the time consumed in setting up those extra ties? How about the labor?

Because RICHMOND tying devices are prefabricated for your particular job, they are stronger, more dependable . . hence you need less of them by comparison with makeshifts. Where a given number of hit-or-miss tying devices are used for a wall form, half the number of RICHMOND tying devices may do the trick — do it better — and faster!

True, the cost of RICHMOND tying devices is a little higher per unit than makeshifts — but the saving you effect in material, time and labor more than makes up that cost. The old, old story of economizing with the best.

★

For a practical demonstration of RICHMOND Form Tie economy with respect to your job — just drop us a line outlining your problem.

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RICHMOND SCREW ANCHOR CO., INC.

Tying Devices for Concrete

241-251 BUSH STREET
BROOKLYN, NEW YORK

No ventilating job is too **TOUGH** *for*

VENTUBE

Can be used under severest conditions to carry adequate fresh air to the most remote faces . . .

THE use of flexible "Ventube" rubberized ventilating duct assures the delivery of sufficient fresh air to exceed the demands set up by states with dust control laws. "Ventube" in the proper size and with adequate pump reduces the dust count well below the safe hygienic limits—thereby providing your men with adequate protection against dust hazards.

"Ventube" is now being used on some of the biggest, most difficult jobs—including New York City's Sixth Avenue subway, the Queens Mid-Town tunnel, the Lincoln tunnel and the Delaware Aqueduct.

A representative will be glad to show you how "Ventube" will cut your ventilating costs—and to help figure the cheapest, most efficient installation. Write for complete information.

DU PONT

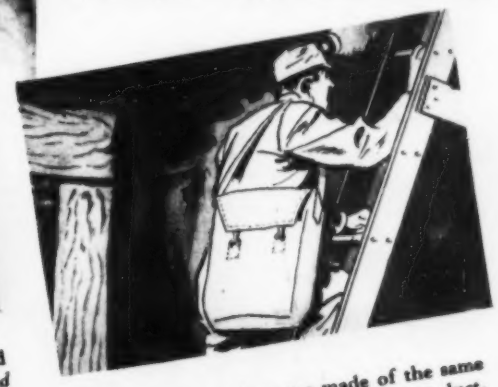
VENTUBE

THE FLEXIBLE VENTILATING DUCT

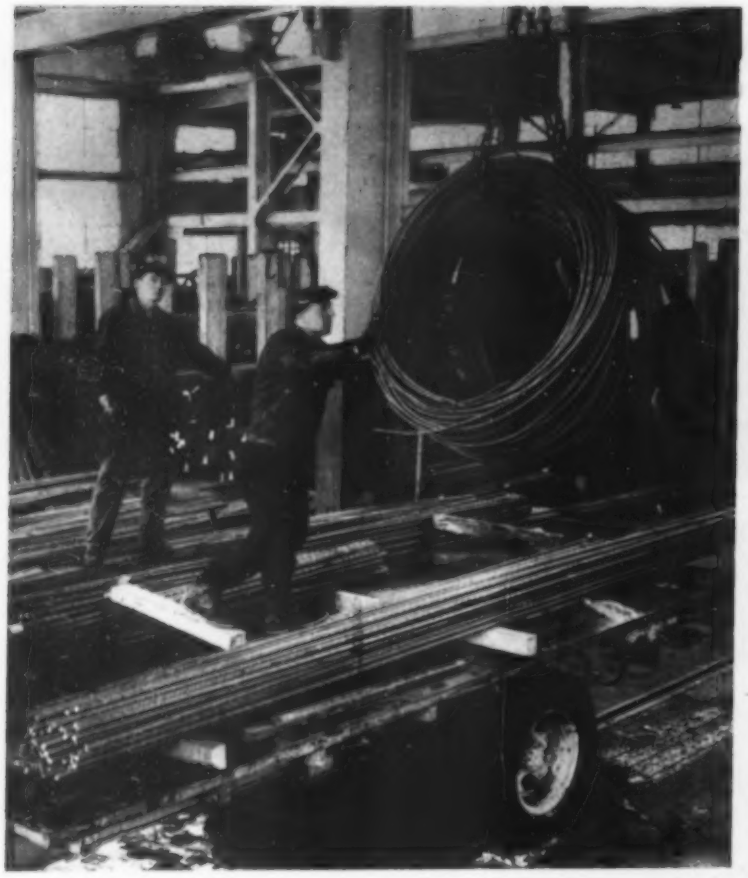
E. I. du Pont de Nemours & Co., Inc.
Fabrikoid" Division • Fairfield, Conn.

• You salvage the entire "Ventube" system. Just take it down, roll it up, and carry it to the next job. The new-type suspension hooks make its removal quick and easy. When blasting, the sections nearest the working face slide back in a jiffy.

• "Ventube" is made of extra-heavy, long fibered Hessian cloth that is *both coated and impregnated with resistant rubber*. The non-collapsible type pictured is ideal for expelling dust-laden air from the tunnel as well as for carrying in fresh, clean air.



• Du Pont powder bags are made of the same type material as is "Ventube" ventilating duct. This tough, rubberized fabric gives long, economical service under most difficult conditions. Write for prices, sizes and complete information



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Put it up to Bethlehem

Chances are there's a Bethlehem warehouse in your vicinity. If so, you can get reinforcing bars in a matter of hours on a rush order. Even if the warehouse is not very close, you can still get fast service, as Bethlehem warehouses are strategically located with respect to transportation facilities. And they're manned by men who realize the value of quick service, who start action the minute your call comes in.

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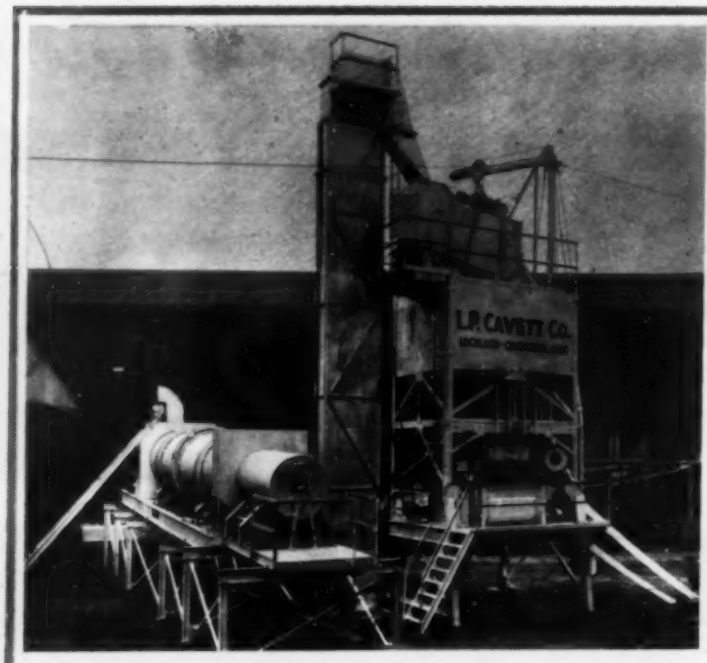
BETHLEHEM STEEL COMPANY



A NEW PORTABLE ASPHALT PLANT

in completely assembled sectional units easily moved by truck or rail and quickly erected without the use of a crane or gin pole.

Patents applied for — Built in 4 Sizes

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HETHERINGTON & BERNER, INC.

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"UP SHE GOES"

Ten per cent grade! Besides the right side of screed is dropped 10" below the curbing. It takes a machine with "stamina" to do work like this.

FLEXIBLE ROAD JOINT MACHINE CO.

WARREN, OHIO

All Perfectly BALANCED

"HERCULES" (Red-Strand) Wire Rope offers more than the strength required for hard work, because we have learned from experience that more than strength is necessary.

We protect the strength built into "HERCULES" (Red-Strand) with these other essentials—toughness . . . flexibility . . . durability . . . and elasticity—all kept in correct balance. A method we have evolved during our eighty-one years of manufacturing experience.

In "HERCULES" (Red-Strand) Wire Rope you always get all FIVE, properly balanced for maximum performance. It is the wire rope of real economy.

"HERCULES" (Red-Strand) Wire Rope is also available in a wide range of both Round Strand and Flattened Strand Constructions—all of which can be furnished in either the Standard or Preformed type. If you will tell us how you use wire rope, we shall be glad to suggest the construction we consider best for your particular conditions.

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A. Leschen & Sons Rope Co.

ESTABLISHED 1857

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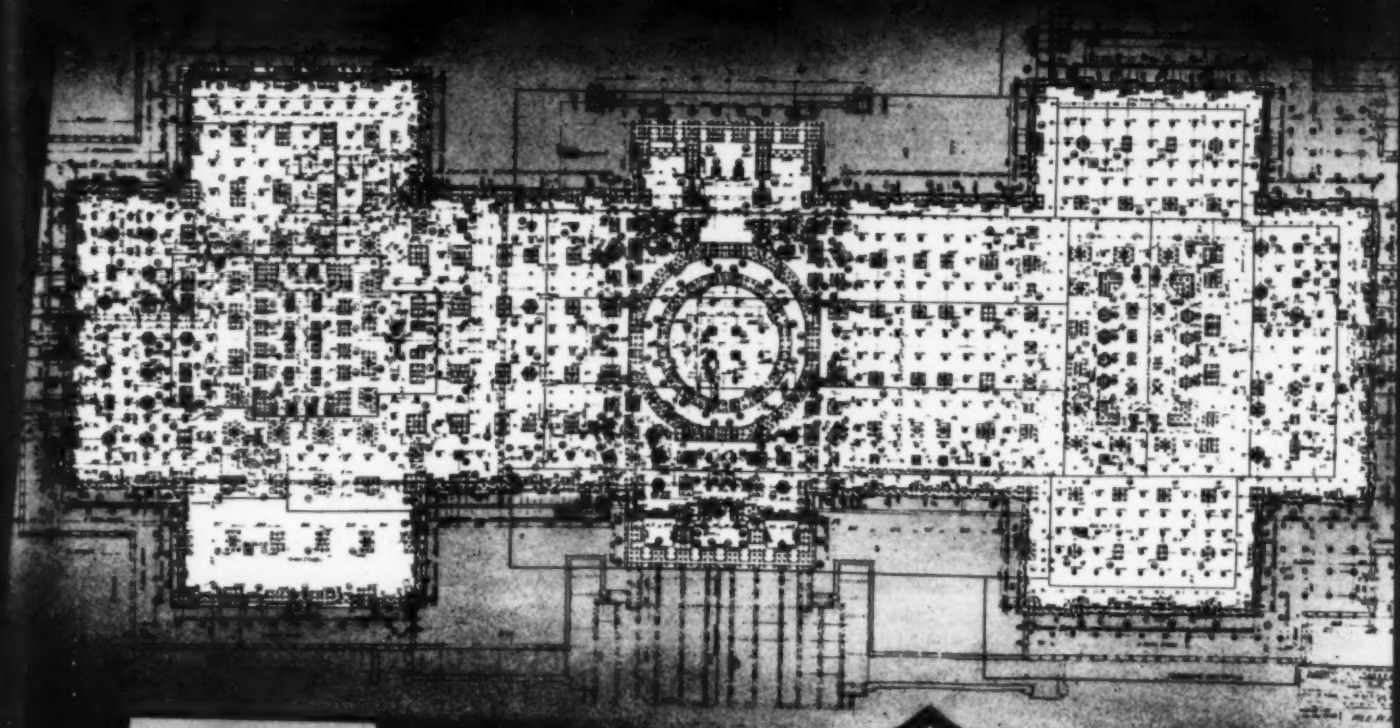

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32 Miles
of Union Metal *Fluted Monotube* Piles Driven for National Gallery of Art Foundation

• Every dot indicated on the above plan represents one of approximately 7000 Union Metal *Fluted Monotube* Piles which support the foundation of the new National Gallery of Art in Washington, D. C. This building, made possible by the A. W. Mellon Educational and Charitable Trust at a cost running into millions, will cover four acres of ground and called for one of the largest piling jobs ever placed under a structure of this type.

The seven thousand 18 to 40-ft. tapered steel piles, totaling 32 miles in length, were driven with No. 1 Vulcan hammers to 35-ton bearing. Six rigs were used during the peak of the driving operations and the log showed that one attained a speed of 54 pile in 7 hours. All were installed and filled with concrete well under the 90-day contract limit.

Union Metal *Fluted Monotube* Piles possess distinct advantages—ruggedness, structural strength, and light weight, making possible speedy and economical installation by any contractor with standard crawler crane equipment. Write today for catalog describing this product and how it can save you time and money in your piling work.

THE UNION METAL MANUFACTURING CO.
CANTON, OHIO

HEIL DIG-N-CARRY *Plus* VALUES

In addition to ALL of the construction and operating features found in the usual four wheel scraper the Heil Dig-N-Carry offers these "PLUS" VALUES —

1. GUARANTEED HYDRAULIC SYSTEM designed and built by the same organization that produces world famous Heil Hydraulic dump units.
2. SPREAD & CUT INDICATOR takes the guess-work out of scraper operation.
3. HYDRAULICALLY operated rear push-out apron insures UNINTERRUPTED Scraper operation in any kind of soil, rain or shine.
4. POWERFUL COMPRESSION SPRINGS lift loaded bowl from cut thus conserving all of tractor power for pulling.

These are the HEIL DIG-N-CARRY "PLUS" VALUES that dirt movers everywhere are "cashing in" on — By all means investigate Heil Dig-N-Carry "PLUS" VALUES NOW — Complete facts are yours for the asking — Address:

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FACTORIES: **MILWAUKEE, WISCONSIN; HILLSIDE, NEW JERSEY**

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O. K., HEIL. Send complete facts about HEIL DIG-N-CARRY SCRAPERS to:

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Here's the **PROOF** *that*

GAR WOOD SCRAPERS

have everything it takes to be the CHAMPION LOW COST DIRT MOVERS

These features behind GAR WOOD'S champion low cost performance, are winning the respect of contractors in every section of the country.

Gar Wood "L 12" and Allis Chalmers "L O" getting that last pound of dirt before speeding to the fill.

1. Hydraulic down pressure on the cutting edge assures positive digging in hard soil.

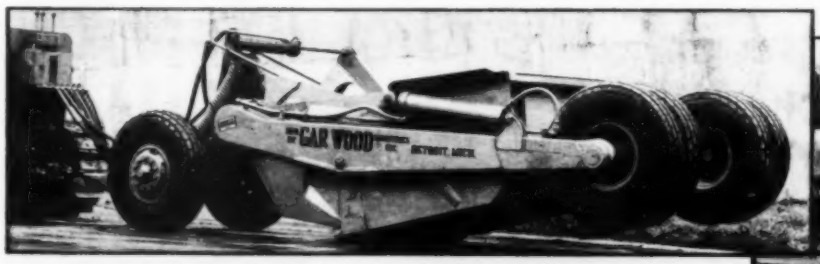
2. Automatic spring lift raises blade instantly without consuming any tractor power.

3. The ability to shorten the wheelbase when hauling gives maneuverability and greater speed when going to the fill.

4. Gar Wood's control of depth of spread is independent of the dumping angle of the bowl.

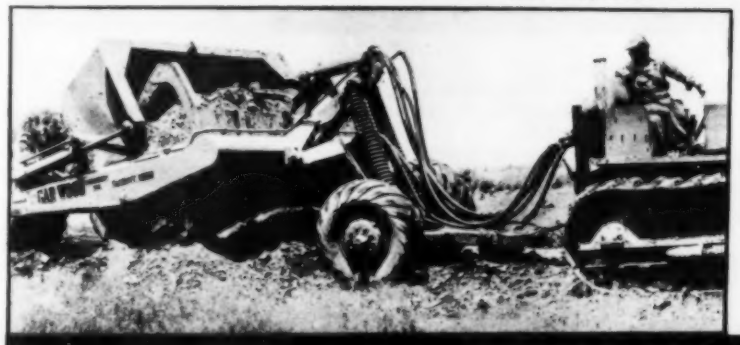
5. Hydraulic down pressure has the advantage in hard soils over the scraper which depend on only weight for digging action.

6. In spreading position the cutting edge is comparable to a grader or bulldozer blade.



12 yd. Gar Wood in digging position, with hydraulic down pressure exerted on cutting edge.

Gar Wood scraper in carrying position. Note the spring release feature which lifts the blade and shortens the wheelbase for maneuverability.



Gar Wood in dump and spread position, here the cutting edge is comparable to a grader or bulldozer blade.

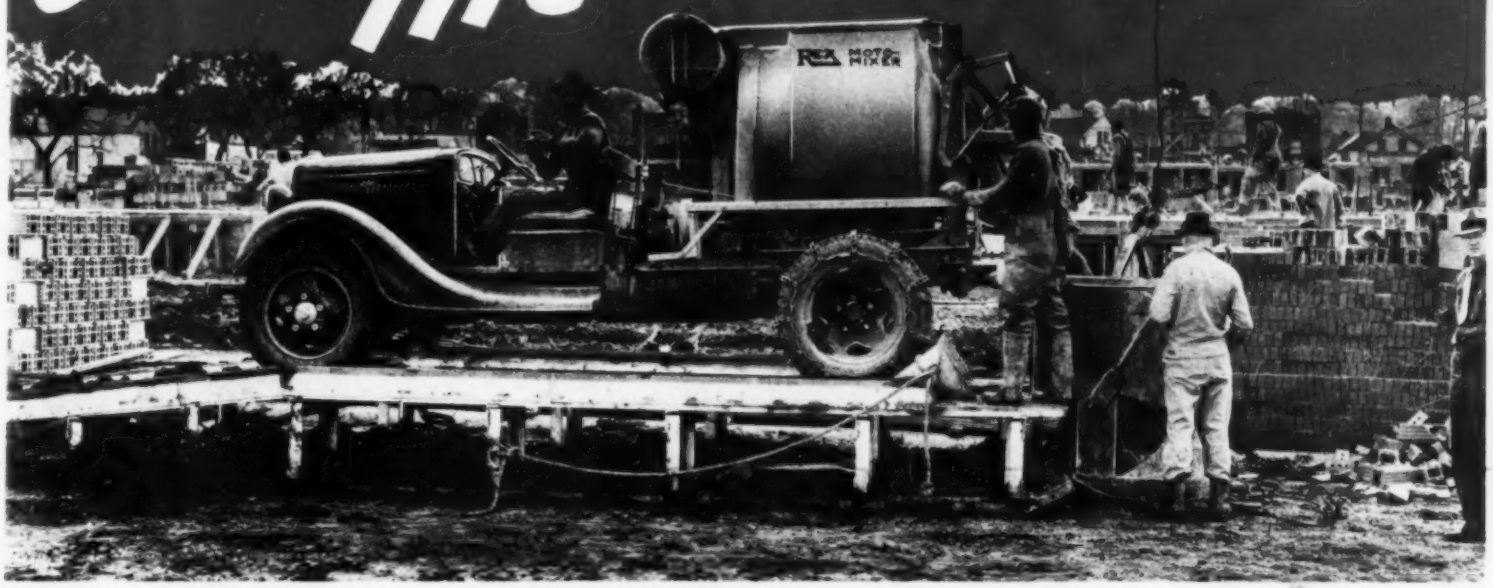
For complete details, see your Allis-Chalmers equipment dealer or write for Bulletin R135.

ROAD MACHINERY DIVISION

GAR WOOD INDUSTRIES, INC., DETROIT, MICHIGAN

SCRAPERS • TRAIL BUILDERS • BULLDOZERS • RIPPERS • SNOW PLOWS • TAMPERS

Again Moto Mixers OUTBID THE OLD STUFF!



ON ANOTHER MODERN HOUSING PROJECT

On the Logan Fontenelle homes project in Omaha, Rex Moto-Mixers again showed their superiority on this type of work by mixing and transporting over 9,000 yards of concrete and 2,000 yards of mortar.

The contractor used four 1-yd. Rex Moto-Mixers, had his weighing batchers and bins located two blocks from one corner of the project, with material storage also located at this point. From here to every point in the project, Rex Moto-Mixers carried bigger payloads at lower cost per ton-mile. Modern methods of mixing, transporting and placing concrete *again* proved that it *"paid to forget the old stuff!"*

This huge housing project, covering more than seven city blocks, contains 29 apartment buildings and three heating plants—called for concrete in floors, walls, foundations, roof slabs—mortar in all the brickwork.

Rex Moto-Mixers, with their Seven Exclusive Features and their unparalleled background of superior performance on jobs from coast to coast, keep this contractor well supplied with money-making jobs. *They will do the same for you when* you *"forget the old stuff!"*

Now

GET THIS NEW FREE BOOK!

"Payloads for '38"—shows in black and white the many advantages you gain by turning to Rex Moto-Mixers and Agitators. A copy will be sent to you free of charge upon your request. Use handy coupon below.

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Gentlemen: Please send me my copy of "Payloads for '38."

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330 West 42d St., New York City

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CONSTRUCTION Methods and Equipment

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Established 1846

AMERICAN CHAIN & CABLE COMPANY, Inc.

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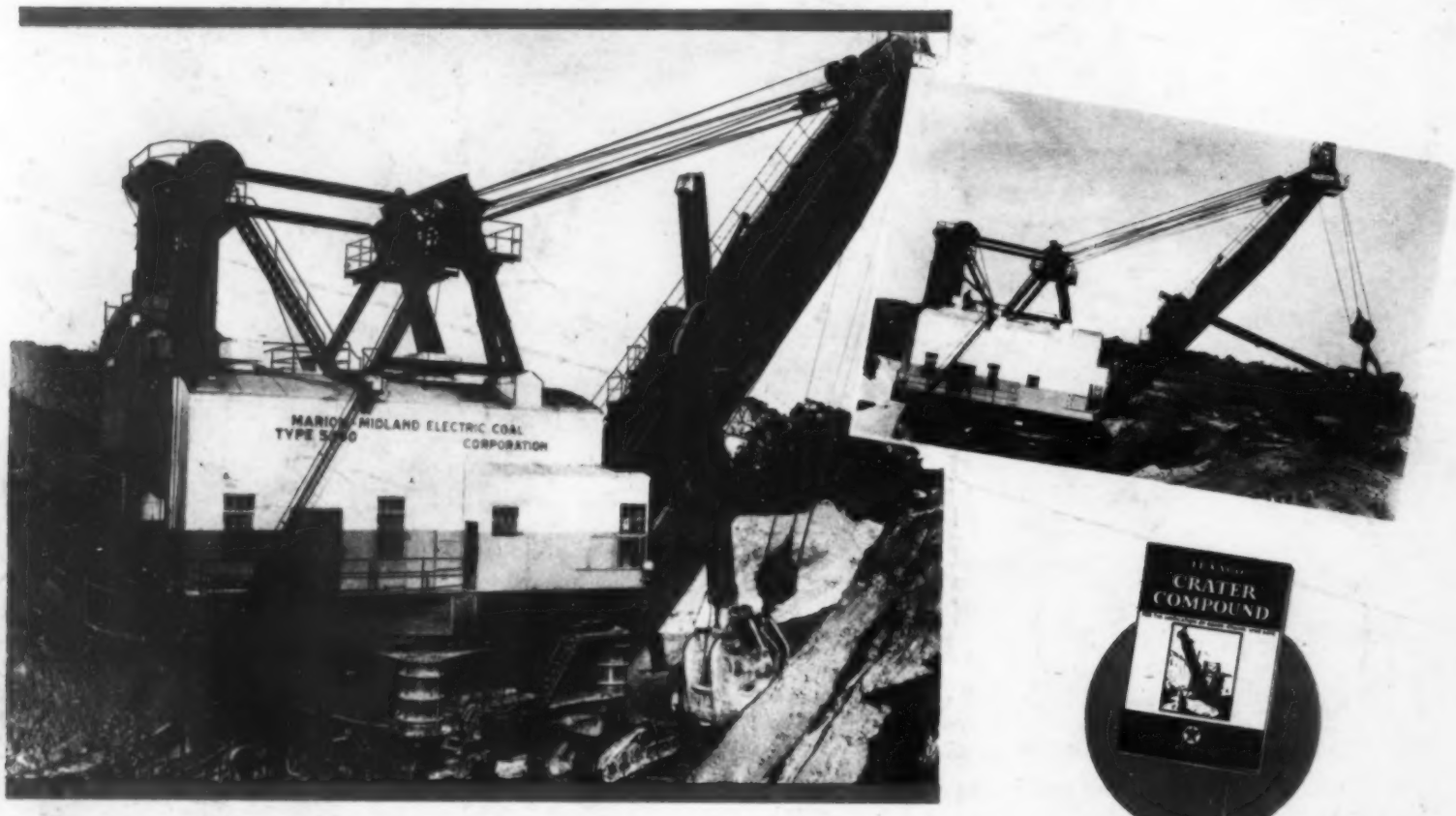
LAY·SET *Preformed* WIRE ROPE

ALL HAZARD WIRE ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE GREEN STRAND

A *27-ton Bite...* WITH TEXACO



Built for the Midland Electric Coal Corporation, this Marion shovel originally swung a 20 cu. yd. dipper. In October, 1937, the capacity was increased nearly 40% by installing a 27 cu. yd. dipper. This shovel is self-leveling, moves under its own power on a series of crawlers with overall width of nearly 42 ft. A complete plant in itself. Six different Texaco Lubricants are in regular use.

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